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D. M.	D. W.	MEMORANDA.
1	Tu	*For* Meetings of Societies, *see pp.* 514–562.
2	W	
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
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22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	
29	Tu	
30	W	
31	Th	

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PHOTOGRAPHIC SOCIETIES OF THE UNITED KINGDOM.

Aberdeen and North of Scotland Amateur Photographic Society.—(ESTABLISHED 1891.)—Meetings held at 26 Broad Street, Aberdeen. *President*—W. A. Hawes. *Vice-Presidents*—Alexander McKilligan and George Robertson. *Committee*—L. M. Gibb, James Glass, G. P. Duffus, G. Grant, Alexander Grubb, James Smith, D. Stuart, James Milne. *Treasurer*—William Thomson. *Secretary*—James Main, 75 George Street, Aberdeen.

Accrington and District Camera Club.—(ESTABLISHED 1892.)—*President*—Dr. Clayton. *Vice-Presidents*—A. Barnes, W. J. Cheney, W. Clayton, T. Stanley. *Committee*—J. Barnes, F. Bradshaw, A. Greenwood, J. A. Hanson, J. R. Hitchon, W. Kenyon. *Secretary and Treasurer*—Isaac Hanson, Rothwell Heights, Accrington.

Affiliation of Photographic Societies.—*Chairman*—Edgar Clifton (Photographic Club. *Auditors*—J. W. Marchant (North Middlesex Photographic Society) and P. Everitt (London and Provincial Photographic Association). *Treasurer*—George Scamell, c/o R. Child Bayley, 12 Hanover Square, London, W.

Aintree and District Society of Photographers and Lanternists.—(ESTABLISHED 1894.)—Meetings are held at the Club Room, St. John's Church Schools, Rice Lane, Walton. *Hon. President*—I. E. Bennett. *President*—W. B. Hellon. *Vice-President*—J. R. Jones. *Council*—R. M. Owen, W. H. Lloyd, W. Lockier, J. Harris, G. Ashley, George Massey Noakes, T. Beer, T. Fowler. *Hon. Librarian*—G. H. Jackson. *Hon. Treasurer*—D. J. Neill. *Hon. Secretary*—C. H. Adkins, 28 Orrell Lane, Aintree.

Aldenham Institute Camera Club.—(ESTABLISHED 1889.)—Meetings are held every alternate Tuesday, at 8.30 p.m., at the Aldenham Institute, Goldington Crescent, Pancras Road, London, N.W. *Chairman*—W. V. Mingard. *Committee*—J. Owen, J. Holloway, T. Harrison, W. S. Watling. *Hon. Secretary*—E. Pringle, Aldenham Institute, Goldington Crescent, Pancras Road, London, N.W.

Altrincham Photographic Society.—Meetings held on the second Thursday of each month, at the Technical School, George Street, Altrincham. *President*—J. Drinkwater. *Vice-President*—J. Davenport. *Committee*—H. Jones, H. Kelley, W. Agar Renshaw. *Hon. Treasurer*—J. G. B. Barber. *Hon. Secretary*—J. Taylor Hughes, Ashley Road, Altrincham.

Amateur Photographic Field Club.—(ESTABLISHED 1860.)—*President*—F. P. Cembrano, jun. *Secretary and Treasurer*—B. Gay Wilkinson, 151 Bermondsey Street, London, S.E.

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Amateur Photographic Association.—(Established 1861.)—Meetings held at 58 Pall Mall, London, S.W. *President*—H.R.H. the Prince of Wales. *Vice-Presidents*—H.R.H. The Duke of Cambridge, His Grace the Archbishop of York, H.H. the Duke of Teck, the Lord de Ros, the Earl of Rosse, James Glaisher, F.R.S. *Council*—Sir J. Whittaker Ellis, Bart., John Aird, M.P., C. Stephens, M.A., W. D. Howard, F.I.C., R. O. Milne, W. S. Hobson, Walter Wood. *Assistant Secretary*—A. Newton Melhuish.

Amateur Photographic Research Camera Club.—(Established 1894.)—Meetings held in members' houses by turn. *President*—Sidney Greer. *Vice-President*—James Collins. *Committee*—President, Vice-President, Treasurer, Secretary. *Treasurer*—Robert B. Gardner. *Secretary*—John C. W. Davidson, Windsor Park, Belfast.

Arbroath Amateur Photographic Association.—(Established 1890.)—Meetings held at the Y.M.C.A. Rooms. *President*—George G. Dalgarno. *Vice-President*—Robert Moodie. *Committee*—Robert Davidson, James McLeish, David Young, James S. Whyte, John McLean. *Treasurer*—George K. Reid. *Secretary*—James Hood, 94 High Street, Arbroath.

Ashton-under-Lyne Photographic Society.—(Established 1891.)—Meetings held at Henry Square, Ashton-under-Lyne. *President*—Dr. Alexander Hamilton. *Vice-Presidents*—Major Bradley, Thomas Glazebrook, J. W. Kenworthy, J.P., C. Lord. *Committee*—W. C. Brown, T. Cheyne, J. Hutchinson, S. A. Platt, T. F. Kershaw, H. Rausch, C. E. Redfern, J.P., S. Woolley. *Librarian*—Walter Chadwick. *Treasurer*—Walter Leigh. *Secretary*—Robert T. Marsland, 24 Park Parade, Ashton-under-Lyne.

Aston Natural History and Photographic Society.—(Established 1892.)—Meetings held at Burlington Hall, High Street, Aston. *President*—Councillor Hill Norris, M.D., J.P. *Vice-Presidents*—William Tylar and Councillor S. Fisher. *Treasurer*—F. Wallis. *Secretary*—Frederick W. Pilditch, 185 Bevington Road, Aston Park.

Banbury and District Photographic Society.—(Established 1894.)—Meetings held at the Municipal Schools, Banbury. *Committee*—S. H. Beale, A. J. Brummitt, T. J. H. Blinkhorn, N. G. Ffrench, T. E. Orchard, W. Potts, H. Stanley, W. E. Wood. *Treasurer*—W. R. Sansbury. *Secretary*—J. Davenport, Brookfield, Banbury, Oxon.

Barnsley and District Photographic Society.—(Established 1893.)—Meetings held at the Arcade Board Schools, Market Hill, Barnsley. *President*—O. de Mirimonde. *Vice-Presidents*—A. R. Tomlin and T. Parkes, M.A. *Committee*—C. W. Guest, A. Haigh, W. Taylor, W. Coles, J. G. Taylor, W. Mason. *Secretary and Treasurer*—Charles Robert Barham, 9 Corporation Street, Barnsley.

Barrow-in-Furness Naturalists' Field Club (Photographic Section.)—(Established 1890.)—Meetings held at Cambridge Hall. *President*—William Dunlop. *Vice-Presidents*—C. J. Weston and J. Timms. *Committee*—Messrs. Dunlop, Weston, Timms, Walton, Carless, Huddleston, Redhead, Brockbank, and Bailey. *Treasurer*—F. Walton. *Secretary*—John Carless, 192 Dalton Road, Barrow-in-Furness.

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Bath Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Royal Literary and Scientific Institution. *President*—Aug. F. Perren. *Vice-Presidents*—George F. Powell and E. Lambert. *Committee*—Austin J. King, E. J. Appleby, G. Norman, Rev. E. A. Purvis, Colonel Sealy, the Very Rev. Monsignor Williams, D. Prout Williams. *Secretary and Treasurer*—W. Middleton Ashman, 12A Old Bond Street, Bath.

Batley and District Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Technical School. *President*—J. T. Tubb. *Vice-Presidents*—P. Sheard and C. Naylor. *Committee*—H. Buckley, R. Hall, J. H. Woods, T. H. Fox, H. Keighley. *Treasurer*—A. Bagshaw. *Secretary*—A. S. Fox, Springfield Villa, Batley.

Belfast Y.M.C.A. Camera Club.—(ESTABLISHED 1889.)—Meetings held at 14 Wellington Place. *President*—W. J. D. Walker. *Vice-Presidents*—F. Megarry, J.P., T. F. Bell, William Strain, T. B. Scott. *Committee*—James Pollock, A. R. Hogg, John Coates, E. Bingham, F. Knox, A. George. *Secretary and Treasurer*—James McCleery, 14 Wellington Place, Belfast.

Beverley Photographic and Sketching Society.—(ESTABLISHED 1893.)—Meetings held in the Club Room, Butcher Row. *Patron*—Tom Turner, J.P. (Mayor). *President*—E. R. B. Hall-Watt, J.P. *Vice-Presidents*—Rev. F. J. Hall, Dr. Croke, J. A. Ridgway, W. H. Fisher. *Committee*—Mrs. W. Thompson, T. B. Burton, J. M. Ridgway, W. Barnard, jun., G. Dawson, H. W. Kirby. *Hon. Librarian*—H. Mann. *Treasurer*—A. W. Pickering. *Secretary*—T. J. Morley, Toll Gavel, Beverley, Yorkshire.

Birkenhead Photographic Association (Y.M.C.A.).—*President*—William Shillinglaw. *Committee*—Percy Rae, Edward Newall, R. J. Walker, J. W. Walton, John Brown, — Hosking, W. H. Ralston. *Treasurer*—Sidney Whetton. *Secretary*—Richard J. Russell, Chesnut Grove, Tranmere Park, Birkenhead.

Birmingham Natural History and Philosophical Society.—(ESTABLISHED 1858.)—Meetings held at Mason College. *President*—Joseph Landon, F.G.S. *Vice-Presidents*—T. H. Waller, B.A., B.Sc., and Professor J. H. Poynting, D.Sc., F.R.S. *Committee*—Professors Allen, Bridge, Fielder, Hillhouse, and Windle, Messrs. Edmonds, Gray, Grove, Lea, Levick, Panton, Pumphrey, Chase, Martineau, Wilkinson, W. J. Harrison, Udall, Hughes, and Browett. *Treasurer*—C. A. Harrison. *Secretaries*—W. P. Marshall, M.I.C.E., Richmond Hill, and Walter E. Collinge, F.Z.S., Mason College.

Birmingham Photographic Society.—(ESTABLISHED 1885.)—Meetings held at Exchange Buildings, Stephenson Place, Birmingham. *President*—Sir J. Benjamin Stone, M.P., J.P., F.G.S., F.L.S., F.R.G.S., F.R.A.S. *Vice-Presidents*—G. F. Lyndon, J.P., W. Jones, E. C. Middleton, J. H. Pickard. *Council*—W. Bateman, W. T. Greatbatch, A. R. Longmore, T. W. Robinson, G. A. Thomason, E. Underwood, E. Winn. *Librarian*—H. S. Horton. *Curator*—D. B. Robertson. *Treasurer*—R. C. Cartwright. *Secretary*—C. J. Fowler, Court Mount, Erdington, Birmingham.

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Blairgowrie and District Photographic Association.—(ESTABLISHED 1894.)—Meetings held at the Club Room, 7 Brown Street, Blairgowrie. *President*—Alex. Geekie. *Vice-Presidents*—Miss White and John B. Maclachlan. *Committee*—J. Richardson, R. J. Scott, George Soutar, A. Folkarde. *Treasurer*—J. T. Gibson. *Secretary*—John G. Hume, 7 High Street, Blairgowrie.

Bolton Photographic Society.—(ESTABLISHED 1879.)—Meetings are held at 10 Rushton Street, Bolton. *President*—J. R. Bridson, J.P. *Vice-Presidents*—B. H. Abbatt, E. N. Ashworth, W. Banks, J. Boothroyd, R. Harwood, W. Knowles, J. Taylor. *Council*—J. E. Austwick, W. Collier, T. Davies, R. Flintoff, W. Green, A. Harper, Dr. Johnston, J. Leach, J. S. Roscow. *Hon. Secretary and Treasurer*—C. K. Dalton, 50 Higher Bridge Street, Bolton.

Bootle Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at Stanley Hall, Stanley Road, Bootle. *President*—W. R. Brewster. *Vice-Presidents*—T. Pinnington and E. T. Cockerham. *Council*—Messrs. Bond, McHarg, Parke, Trant, Taylor, and Wright, Mesdames Knowles, Marriott, and Thompson. *Treasurer*—E. L. Marriott. *Secretary*—F. W. Knowles, 311 Stanley Road, Bootle, Lancashire.

Border Amateur Photographic Association.—(ESTABLISHED 1892.)—Meetings held at Galashiels. *President*—Rev. J. Burnet Thomson, B.D. *Vice-President*—F. A. Blair, F.C.S. *Secretary and Treasurer*—Benjamin Cartwright, A.P.S., 50 High Street, Galashiels, N.B.

Bournemouth Photographic Society.—(ESTABLISHED 1890, REORGANISED 1894.)—Meetings held at Athenæum Chambers, Town Hall Avenue. *President*—J. W. Bennett. *Vice-Presidents*—Dr. Hyla Greves and Rev. H. Lee. *Committee*—J. Stanley, T. Hodson, A. Youngman, T. Lee Lloyd, H. Sharpe, P. H. Price. *Treasurer*—W. Jones. *Secretary*—E. Greenleaves, Priory Mansions, Bath Road, Bournemouth.

'Boys' Own' Postal Photographic Club.—(ESTABLISHED 1889.)—*Secretary and Treasurer*—J. E. Hardwich, 7 Belford Terrace, Sunderland.

Bradford Photographic Society—(ESTABLISHED 1895.)—Meetings held at Unity Rooms, Sunbridge Road. *President*—Alex. Keighley. *Vice-Presidents*—Percy Lund, R. J. Appleton, W. H. Scott, F. H. Bentham, F. J. R. Sutcliffe. *Committee*—J. Tindell, P. Wilkinson, J. Jackson, J. W. Cundall, F. E. Fearnside. P. R. Salmon, Rev. W. H. Eastlake, O. Nicholson, A. P. Rendell, F. Nicholson, F. Sowden, W. C. Ramshaw. *Secretary and Treasurer*—J. Snowden, c/o Messrs. Percy Lund & Co., Limited, 5 Godwin Street, Bradford.

Brechin Photographic Association.—(ESTABLISHED 1888.)—Meetings held at the Photographic Rooms, Park Road. *President*—William Shaw Adamson. *Vice-Presidents*—James D. Ross and Robert W. Duke. *Committee*—John Cuthbert, William Dakers, John Small. *Curator*—D. B. Robertson. *Treasurer*—James B. Mitchell. *Secretary*—Alexander Watson, 75 River Street, Brechin, N.B.

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Brighouse Photographic Society.—(ESTABLISHED 1894.)—Meetings held at 6 Huddersfield Road, Brighouse. *President*—Dr. George A. Farrer. *Vice-Presidents*—George Hepworth, A. Ormond, John Wood. *Committee*—F. M. Cardwell, T. H. Wood, H. P. Metcalf, P. Ferguson, H. Blackburn. *Treasurer*—E. H. Sugden. *Secretary*—J. H. Georgeson, 6 Huddersfield Road, Brighouse.

Brighton and Sussex Natural History and Philosophical Society (Photographic Section).—(ESTABLISHED 1892.)—Meetings are held at the Free Library and Museum, Church Street, Brighton. *Chairman*—W. C. Wallis. *Committee*—D. E. Caush, G. Foxall, W. Harrison, W. W. Mitchell, W. H. Payne, J. P. Slingsby Roberts, C. B. Stoner, H. V. Shaw, A. H. Webling. *Secretary*—R. C. Ryan, 43 Compton Avenue.

Brighton Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Brighton Town Hall. *President*—H. Spencer Bridge. *Vice-President*—H. G. Caithness. *Secretary and Treasurer*—E. Burnham, 9 St. James's Street, and 52 Gardner Street, Brighton.

Bristol and West of England Amateur Photographic Association.—(ESTABLISHED 1874.)—Meetings are held at the Literary and Philosophic Club, Berkeley Square, Bristol. *President*—H. A. Hood Daniel. *Vice-Presidents*—Colonel Playfair and Edward Brightman. *Council*—W. C. Hemmons, Sidney J. Hill, Walter Norgrove, John Phillips, and Officers. *Treasurer*—W. Moline. *Secretaries*—Edward Brightman, Lyndale, Redland Road, and Martyn Lavington, The Avenue, Redland.

Bristol Camera Society.—(ESTABLISHED 1887.)—Meetings are held at the Kensington (Government) School of Science and Art, Berkeley Square, Bristol. *President*—Harvey Barton. *Vice-Presidents*—C. Bryant and T. Routledge. *Committee*—T. Crank, M. E. Dunscombe, J. Fisher, E. Parnall. *Treasurer*—G. L. Wood. *Secretary*—E. R. Jakeways, Hope Villa, St. Mark's Road, Stapleton Road, Bristol.

British Association for the Advancement of Science.—(ESTABLISHED 1831.)—The meeting in 1896 will be held at Liverpool on September 16. *President*—Sir Joseph Lister, Bart., For. Sec. R.S. *General Treasurer*—Prof. Arthur W. Rücker, M.A., F.R.S. *General Secretaries*—Captain Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S., F.G.S., 12 Chester Street, London, S.W., and A. G. Vernon Harcourt, M.A., D.C.L., LL.D., F.R.S., F.C.S., Cowley Grange, Oxford. *Assistant General Secretary*—G. Griffith, M.A., College Road, Harrow, Middlesex.

Brixton and Clapham Camera Club.—(ESTABLISHED 1889.)—Meetings are held every Tuesday at Eight p.m., from October to March, and fortnightly from April to September, at Brixton Hall, Acre Lane, London, S.W. *President*—James W. Coade. *Vice-Presidents*—W. H. Harrison and G. P. Wyatt. *Council*—C. F. Archer, T. J. Bartrop, E. Dockree, J. Gunston, J. Price, G. W. Welham. *Secretary*—Frederick W. Levett, 11 Corrance Road, Acre Lane, S.W.

Burton-on-Trent Natural History and Archæological Society (Photographic Section).—Meetings held at 30 High Street, Burton-on-Trent. *President*—R. Churchill. *Secretary*—R. N. Blackburn, 86 Blackpool Street, Burton-on-Trent.

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Bury Photographic and Arts Club.—(Established 1881.)—Meetings held at the Club Rooms, 14 Market Street, Bury. *President*—William Booth. *Vice-Presidents*—E. W. Mellor, J.P., F.R.G.S., Dr. Mellor, R. Grundy, jun., C. H. Openshaw. *Council*—T. M. Barbour, T. Talbot, W. Heywood, A. Redford, W. Roberts. *Treasurer*—Councillor J. Ward. *Hon. Secretaries*—Roger Wood and Walter Mellor, 10 Bolton Street, Bury.

Camera & Company Postal Photographic Club.—(Established 1891.)—Monthly folio and Discussion. *Secretary*—Albert O. Forrest, 14 Market Street, Pontypridd.

Camera Club.—(Established 1883.)—Club House, Charing Cross Road. *President*—Captain W. de W. Abney, C.B., R.E., F.R.S., P.R.A.S. *Committee*—F. Machell Smith (Chairman), W. Asbury Greene (Deputy Chairman), E. Ferrero (Chairman of Finance Committee), Greensill Allen, H. E. Armstrong, W. Clarke, Francis Cobb, R. W. Cox, G. Davison, A. Deed, J. J. Stuart Edwards, R. Inwards, C. G. Murrell, H. H. P. Powles, F. Seyton Scott, Colonel R. Stewart, E. G. Spiers, S. B. Webber. *Hon. Librarian*—Lyonel Clark. *Hon. Secretary*—R. W. Cox.

Cardiff Photographic Society.—(Established 1886.)—Meetings held at the Castle Arcade, Queen Street. *President*—Samuel W. Allen, M.I.M.E. *Vice-Presidents*—Jonas Watson, J.P., Walter Insole, T. Mansel Franklen, E. H. Bruton, Alexander Kellar, C. F. Gooch, J.P. *Council*—W. H. Kitchen, Frederick Heitzman, William Herbert, Alfred Freke, William Foster, A. McKinnon, D. B. McCallum, William Booth, W. Cocks, Rev. A. T. Fryer, W. J. Jenkins, C. E. Hancock, A. Montgomery. *Treasurer*—G. H. Wills, jun. *Secretary*—T. H. Faulks, 127 Bute Road, Cardiff.

Carlisle and County Amateur Photographic Society.—(Established 1885.)—Meetings are held at the Viaduct Hotel, Carlisle. *President*—The Mayor of Carlisle. *Committee*—Messrs. Mackintosh, Coward, Forsyth, Milburn, Johnston, and Moffat. *Treasurer*—John Robson. *Secretary*—John S. Atkinson, 9 Castle Street, Carlisle.

Cheltenham Amateur Photographic Society.—(Established 1865.)—Place of Meeting, The College Pharmacy, Cheltenham. *President*—General F. Dawson, C.B. *Vice-President*—Colonel H. M. Saunders. *Committee*—W. H. Bagnall, W. Beetham, Dr. G. B. Ferguson, L. Winterbotham. *Secretary*—Philip Thomas, College Pharmacy, Bath Road, Cheltenham.

Chester Society of Natural Science and Literature (Photographic Section).—(Established 1887.)—Meetings held in the Grosvenor Museum, Chester. *Chairman of Section*—Henry Stolterfoth, M.A., M.D., J.P. *Committee*—Mrs. J. H. Hignett, Messrs. P. K. Allen, E. G. Ballard, A.R.S.M., F. Evans, F. T. Farrimond, A. H. Hignett, C. W. Townshend and T. Wakefield. *Secretary and Treasurer*—J. H. Spencer, 36 Bridge Street, Chester.

Chichester Photographic Society.—(Established 1893.)—Meetings held at St. Martin's Hall, Chichester. *President*—George Woodbridge, J.P. *Vice-Presidents*—Dr. Paxton and Dr. E. H. Buckell. *Committee*—F. O. Collins, R. W. Dawtrey, E. Hollebone, E. Thorp, G. M. Turnbull. *Treasurer*—T. H. Vinall. *Secretary*—Ernest A. Long, 15 East Street, Chichester

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Chorley Photographic and Sketching Club.—(Established 1894.)—Meetings held at West Street. *President*—John Stanton. *Vice-Presidents*—J. T. Brierley, S. Morris, H. R. Dorning, N. Alker. *Committee*—J. R. Waring, G. H. Ormerod, William Waring, T. Haworth, E. Lang, T. Swarbrick, A. Collier. *Treasurer*—R. Gill. *Secretary*—Thomas Brindle, 62 Market Street, Chorley.

City and Guilds of London Institute Photographic Society.—Affiliated to the Photographic Society of Great Britain; Delegates, A. J. Chapman and L. G. Upcott Gill. *Committee*—A. J. Chapman, H. Cubitt, Ll. H. Hughes, W. Staynes. *Treasurer*—T. Norris. *Hon. Secretary*—L. G. Upcott Gill.

City and Guilds of London Technical College, Finsbury, Photographic Society.—(Established 1886.)—Meetings held at the Finsbury Technical College, Leonard Street, City Road, E.C. *President*—Sylvanus P. Thompson, D.Sc., B.A., F.R.S. *Vice-Presidents*—R. Meldola, F.R.S., F.I.C., F.C.S., and J. Castell Evans, F.I.C. *Treasurer*—T. H. Norris, A.I.C. *Secretary*—A. J. Chapman, Finsbury Technical College, Leonard Street, E.C. *Assistant Secretary*—E. F. Weismuller, Finsbury Technical College, Leonard Street, E.C.

City of Belfast Y.M.C.A. Camera Club.—(Established 1889.)—Meetings held at 14 Wellington Place, Belfast. *President*—William Swanston, F.G.S. *Vice-Presidents*—W. J. D. Walker, F. Megarry, J.P., William Strain, J. H. Hamilton. *Committee*—T. F. Bell, T. B. Scott, J. A. Pollock, A. R. Hogg, A. George, John Coates. *Secretary and Treasurer*—James McCleery, 14 Wellington Place, Belfast.

City of Dublin Y.M.C.A. Camera Club.—(Established 1891.)—Meetings held at Christian Union Buildings, Lower Abbey Street, Dublin. *President*—Prof. C. R. C. Tichborne, LL.D. *Vice Presidents*—L. Davidson, G. W. Riky, T. Reilly, S. S. McCurry. *Committee*—F. N. Binks, T. Shiels, C. E. Stewart, F. Heatley, W. Hill, P. Barber, A. Campbell. *Treasurer*—G. A. Parnell. *Secretaries*—G. A. Parnell, Glasnevin, Dublin, and H. J. McCormick, 16 Margaret Place, Dublin.

Clapham Y.M.C.A. Photographic Club.—(Established 1892.)—Meetings are held at 49 High Street, Clapham, S.W. *President*—R. D. Gibbs. *Secretary and Treasurer*—G. I. Ninnes, 57 Montholme Road, Wandsworth Common, S.W.

Cleckheaton Mechanics' Institute Photographic Society.—(Established 1895.)—Meetings held at the Technical School, Brooke Street. *President*—Dr. F. Farrow. *Vice-Presidents*—A. E. Knowles, and E. B. Smith Ashton. *Committee*—Lewis Ellis, Ernest Ellis, Willie Hartley, Frank Slinger, Joe Drake, C. H. Cadman, E. W. Taylor. *Treasurer*—Frank Hirst. *Secretary*—William Drake, 10 Northgate, Cleckheaton.

Cleveland Camera Club (late Erimus Amateur Photographic Club.)—(Established 1888.)—Headquarters, Wilson Street. *President*—J. Victor W. Wood. *Vice-Presidents*—J. A Jones and J. J. Dales. *Committee*—Messrs. Wood, Jones, Dales, Walker, Tarrant, Hogg, and Pearson. *Secretary*—Fred W. Pearson, 84 Union Street, Middlesbrough.

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FOR LANTERN FITTINGS SEE PAGES 442 to 463.

Clydesdale Camera Club.—(Established 1889.)—Place of Meeting, Wemyss Bay, Scotland. *President*—Henry Erskine Gordon. *Secretary and Treasurer*—Miss Burns, Castle Wemyss, Wemyss Bay, N.B.

Colne Camera Club.—(Established 1893.)—Meetings held at the Cloth Hall, Colne. *President*—Henry Hewitt. *Vice-Presidents*—J. Duckworth, J. Hey, C. Hirst. *Committee*—Messrs. Bartle, Hey, T. Shaw, J. Robinson, and Grimshaw. *Treasurer*—Jonas Ratcliffe. *Secretary*—William Watson Kirk, 16 Atkinson Street, Colne, Lancashire.

Cornish Camera Club.—(Established 1888.)—Meetings held at the Science School, Penzance. *President*—W. E. Baily, F.L.S., C.C. *Vice President*—B. Vivian, M.R.C.S. *Council*—J. Branwell, jun., N. H. Symons, A.P.S., Barnes Richards, R. Pearce Couch. *Treasurer*—W. Herbert Percy. *Secretary*—H. Tonkin, 22 Market Place, Penzance.

Coventry and Midland Photographic Society.—(Established 1883.)—Meetings held at Cross Cheaping, Coventry. *President*—W. Andrews. *Vice-Presidents*—Henry Sturmey, E J. Walker, F. J. Harker, Rev. H. S. Mercer. *Council*—W. R. Goate, F. W. Hardy, H Waters, W. Sexton. *Treasurer*—W. L. J. Orton. *Secretaries*—A. B. Clarke and H. Mountfort, Hampton House, Cross Cheaping, Coventry.

Craven Naturalists' and Scientific Association (Photographic Section).—(Established 1893.)—Meetings are held at the Grammar School, Skipton, *President*—W. Cecil Slingsby, F.R.G.S. *Secretary and Treasurer*—J. W. Emmett, 3 Bright Street, Skipton.

Crewe Amateur Photographic Society.—(Established 1889.)—Meetings held at the Studio, Chester Bridge. *President*—Rev. W. G. Rainsford, D.D. *Vice-President*—E. Booth. *Committee*—J. Lewis, G. Holden, F. Crooke. *Treasurer*—John Cherry. *Secretary*—Thomas Gorrell, 106 Edleston Road.

Crewe Photographic and Art Society.—(Established 1892. Reorganized 1895.)—Meetings held at the Studio, Chester Bridge. *Committee*—R. H. Dutton, W. Ellis, F. Badger, — Boag, J. Ellam, A. H. Badger (Chairman). *Secretary and Treasurer*—A. Powell, Ormonde House, Edleston Road, Crewe.

Crewe Scientific Society (Photographic Section).—(Established 1892.)—Meetings are held at the Mechanics Institute. *President*—A. H. Hignett. *Committee*—E. A. Crooke, P. J. Ashfield, W. W. Gibson, J. S. Hough, Rev. W. G. Rainsford, D.D., F. C. Tipler. *Treasurer*—C. E. Jones. *Secretary*—W. Bispham, 60 Samuel Street, Crewe. *Assistant Secretary*—J. Laing, Richard Street, Crewe.

Cromwell Photographic Club.—(Established 1891.)—Meetings are held at Cromwell Hotel, Hall Quay, Great Yarmouth, on the first and third Wednesdays in each month, at Eight p.m. Annual Meeting, first meeting in January. *President*—R. H. Inglis-Palgrave, F.R.S. *Vice-Presidents*—Miss V. Buxton, F. Burton, C. S. Watson, John Starling, John Bateley, M.D. *Committee*—H. Palmer, R. T. Brain, T. Goate, T. Blyth, A. Price, E. G. Leech, G. Rumbold, M. Morgan. *Treasurer*—T. W. Swindell. *Secretary*—Charles Rumbold, 4 Dene Side, Great Yarmouth

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Croydon Camera Club.—(ESTABLISHED 1890.)—Meetings held at 70 George Street, Croydon. *President*—Hector Maclean, F.G.S., F.R.P.S. *Vice-Presidents*—James Glaisher, F.R.S., Hon. Sydney Herbert, M.P., The Mayor of Croydon (Alderman F. T. Eldridge). *Council*—W. Burn, G. Corden, W. F. Frost, A. W. Hirst, G. W. Jenkins, J. Noaks, J. Smith, S. H. Wratten, W. Wreford. *Secretary and Treasurer*—H. E. Holland, 69 Lansdown Road, Croydon.

Croydon Microscopical and Natural History Club (Photographic Section).—(ESTABLISHED 1870.)—Meetings are held at the Public Hall, George Street, Croydon. *President*—W. Murton Holmes. *Vice-Presidents*—H. Franklin Parsons, M.D., F.G.S., E. Lovett, H. G Thompson, M.D., J.P., H. T. Mennell, F.R.S , H. S. Eaton, M.A., F.R.Met.Soc. *Committee*—J. Weir Brown, C. Oakley, C. H. B. Sparrow, A. Roods (Librarian), J. H. Baldock, F.I.C. (Lanternist and Recorder). *Treasurer*—E. B. Sturge. *Secretary*—Harry Douglass Gower, 55 Benson Road, Waddon, Croydon, Surrey.

Cyclists' Photographic Portfolio Club.—(ESTABLISHED 1886.)—A circulating Portfolio Club for mutual criticism of members' prints. Four portfolios in circulation. *Secretary*—W. L. J. Orton, 7 Bishop Street, Coventry.

Darlington Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Imperial Hotel. *President*—Leo W. Williamson. *Vice-President*—Sydney C. Rudman. *Committee*—E. V. Clarke, W. Mossom, P. J. Cooper, J. Robinson, W. Ferguson. *Secretary and Treasurer*—J. Calvert, 64 North Road, Darlington.

Darwen Photographic Association.—(ESTABLISHED 1894.)—Meetings held in the Belgrave Schools, Bolton Road entrance. *President*—Rev. Henry Irving. *Vice-President*—John Broome. *Committee*—James Cavis, John F. Leach, George Butterworth, John W. Smith, Albert Almond. *Hon. Secretary and Treasurer*—John A. Hargreaves, High Bank, Darwen.

Denton Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at 33 Ashton Road, Denton. *President*—Albert Turner. *Vice-Presidents*—Rev. L. Scott, Edgar Wilde, Edwin Oldham, John Horrocks, W. H. Denerly. *Committee*—S. T. Ainsworth, E. M. Harwood, B. Bromley, W. H. Duncan, A. Stafford. *Treasurer*—J. M. Bromley. *Secretary*—J. Edwards, 33 Ashton Road.

Derby Photographic Society.—(ESTABLISHED 1884.)—Meetings are held at Smith's Restaurant, Victoria Street, on the third Tuesday in the month, from October to April inclusive; Outdoor Meetings fortnightly during summer. *President*—Captain W. de W. Abney, C.B , R.E., F.R.S., &c. *Vice-President*—G. Walker. *Committee*—C. Bourdin, R. J. Fleet, E. Fearn, C. B. Keene, T. Walker, R. Woods. *Auditors*—Gandy and T. Walker. *Treasurer*—F. Gandy. *Secretary*—Thomas A. Scotton, 9 Church Street, Derby.

Devonport Camera Club.—(ESTABLISHED 1891.)—Place of Meeting, Odd Fellows' Hall, Ker Street, Devonport, Devon. *President*—Charles Croydon, F.R.M.S. *Vice-Presidents*—Dr. W. J. Gard, — Crook, C. H. Moore, J. Bassett. *Committee*—J. F. Coombes, C. Dart, J. A. Boolds, H. Lethbridge. *Treasurer*—R. Lamb. *Secretary*—E. James Seymour F.R.M.S., 18 St. Aubyn Street, Devonport, Devon.

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Devon and Cornwall Camera Club.—(ESTABLISHED 1888.)—Meetings are held at the Athenæum, Plymouth, fortnightly on Tuesday evenings. *President*—Colonel R. Barrington Baker. *Vice-Presidents*—W. G. Tweedy, B.A., and R. Burnard. *Council*—Dr. Aldridge, Messrs. Micklewood, D. Roy Watson, Turney, and Hawker, Miss Hemsley, Miss Keen. *Hon. Treasurer*—C. R. Rendle, M.R.C.S. *Hon. Secretary*—R. Hansford Worth, C.E., 42 George Street, Plymouth.

Doncaster Microscopical and General Scientific Society.—(ESTABLISHED 1880.)—Meetings held at the Free Library, Doncaster. *President*—H. Culpin. *Vice-Presidents*—H. H. Corbett, M.R.C.S., J. B. Prosser, J. Mitchell Wilson, M.D., F.C.S., W. E. Atkinson. *Committee*—F. Whaley, G. B. Bisal, J. R. Thompson, T. Cuttriss, W. Roberts, Mrs. Corbett. *Secretary and Treasurer*—M. H. Stiles, 2 French Gate, Doncaster.

Dorset Amateur Photographic Association.—(ESTABLISHED 1886.)—Place of Meeting, Dorchester. *President*—Rev. Miles Barnes, M.A. *Committee*—President, Hon. Secretary, Miss E. Williams, T. A. Colfox, R. W. Copeman. *Hon. Secretary and Treasurer*—Rev. T. Perkins, M.A., F.R.A.S., Turnworth Rectory, Blandford.

Dukinfield Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Co-operative Hall, Astley Street, Dukinfield. *President*—T. Hodgetts Gordon, B.A., C.C. *Vice-Presidents*—J. T. Lees, S. T. Ainsworth, J. W. Hadfield. *Council*—J. W. Andrew, R. Deakin, W. Jenkinson, P. Rigby, S. Woolley. *Librarian*—H. Broadbent. *Treasurer*—John Winterbottom. *Secretary*—William H. Shirley, King Street, Dukinfield.

Dundee and East of Scotland Photographic Association.—(ESTABLISHED 1879.)—Meetings held at Lamb's Hotel, Dundee. Club Rooms, 87 High Street, Dundee. *President*—Andrew Stewart. *Vice-Presidents*—Professor Steggall and W. Bertie. *Council*—J. D. Cox, W. F. Hill, J. S. Lawson, T. L. Wynd, D. Elder, J. H. Halley, R. C. Henderson, G. G Maclaren, F. Sharp, J. Thow, Dr. Tulloch, A. Wilson. *Secretary and Treasurer*—V. C. Baird, Broughty Ferry, N.B.

Dunstable Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Anchor Gate, Dunstable. *President*—L. C. R. Thring, M.A. *Vice-President*—Dr. Hughes. *Committee*—P. Vlako Turner, J. A. Chambers, — Flemons, — Baudy. *Treasurer*—Albert Gutteridge. *Secretary*—Edward Hare, The Poplars, Dunstable.

Durham City Camera Club.—(ESTABLISHED 1892.)—Meetings are held at the Shakespeare Hall, North Road, Durham. *President*—Rev. H. E. Fox, M.A. *Vice-Presidents*—Professor R. J. Pearce, D.C.L., and Captain E. White. *Council*—R. H. Blyth, G. W. Bater, J. Chapelow, J. Morson. *Treasurer*—Councillor William Gray. *Secretary*—Robert Hauxwell, The Avenue, Durham.

Ealing Photographic Society.—(ESTABLISHED 1890.)—Meetings are held at the Public Buildings, Ealing. *President*—H. W. Peal. *Vice-Presidents*—H. C. Draper, Charles Jones, T. Simpson, W. T. White. *Council*—Dr. Clifford Gibbons, W. G. Gregory, Dr. H. McD. Phillpotts, A. Ernest Smith, Charles Whiting, Roland Whiting, B. E. Peal (Hon. Librarian), A. Richardson (Hon. Curator). *Treasurer*—A. F. Taylor. *Secretary*—R. Yoakley Murphy, Argyle Road, Castle Hill, Ealing, W.

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Eastbourne Photographic Society.—(ESTABLISHED 1892.)—Meetings are held on the first and third Mondays in each month, at the School of Art, Cornfield Road. *President*—H. Habgood, M.D., M.R.C.S. *Hon. Secretary and Treasurer*—J. J. Hollway, 11 Hyde Gardens, Eastbourne.

East London Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Shoreditch Town Hall, E.C. *President*—John H. Gear. *Vice-Presidents*—C. Stone, C. Tyler, M. A. Wilkinson. *Council*—A. Barnard, G. E. Bennett, A. Copping, G. Overy, jun., C. Uffindell. *Secretary*—W. L. Prosser, 76 Ridley Road, Dalston, N.E.

East Worcestershire Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Institute, Bromsgrove. *President*—Charles R. Sayer. *Vice-Presidents*—Austen Chamberlain, M.P., George Abell, J.P., H. Millington, M.A., R. Smallwood, J.P. *Council*—J. Boocock, J. P. Croft, P. K. Tollitt, D. L. Raimbach, Miss Harkinson. *Treasurer*—Frederick Ed. Slater. *Secretary*—William J. Brooke, The Crescent, New Road, Bromsgrove.

Eccles Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Eccles Grammar School. *President*—J. H. Holland. *Vice-Presidents*—W. Broughton and J. H. Crocker, M.D. *Treasurer*—Arthur Bowes, A.M.I.C.E. *Secretary*—Albert Humphry, 2 Sydney Avenue, Patricroft, Manchester.

Edinburgh Camera Club.—(ESTABLISHED 1890.)—*Hon. Secretary and Treasurer*—Henry Tod, jun., W.S., 23 Lennox Street.

Edinburgh Photographic Club.—(ESTABLISHED 1881.)—Meetings are held on the third Wednesday of each month from September to May, in the Photographic Society's Hall, 38 Castle Street, at Eight o'clock p.m. *President*—G. G. Mitchell. *Treasurer*—Thomas Wardale. *Secretary*—Thomas Barclay, 180 Dalkeith Road, Edinburgh.

Edinburgh Photographic Society.—(ESTABLISHED 1861.)—Meetings held at 38 Castle Street, Edinburgh, on the first Wednesday in each month, except January, when it is the second Wednesday. *President*—J. C. Oliphant, M.A. *Vice-Presidents*—F. P. Moffat and James Patrick. *Council*—Andrew H. Baird, Alexander Eddington, William Fowler, Herbert L. Gardiner, John Stewart Smith, J. R. Roddick, P. M. Macintyre, Charles J. Souter, J. C. H. Balmain, William Linton, J. B. Johnston, Robert Ayton. *Treasurer*—George Cleland. *Secretary*—J. S. M'Culloch, W.S., 2 George Street, Edinburgh.

Edinburgh University Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 3 Bristo Place, Edinburgh. *President*—Dr. T. W. Drinkwater. *Vice-Presidents*—Dr. Logan Turner, Professor Cossar Ewart, Dr. Cathcart. *Committee*—W. P. Craig, E. R. S. Hale, J. G. C. Scott, H. Colman, Ruston Harrison, Wallace McGregor. *Secretary and Treasurer*—H. Overton Hobson, University Union, Park Place, Edinburgh.

Edinburgh Viewfinders' Club.—(ESTABLISHED 1890.)—Meeting, first Monday of each month at Eight p.m., at 31 Chambers Street. Annual Meeting, October. *Secretary and Convener*—Thomas W. Drinkwater, Ph.D., L.R.C.P.Ed., 31 Chambers Street, Edinburgh.

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Eton College Photographic Society.—(ESTABLISHED 1891.)—Place of Meeting, Eton College. *President*—Rev. T. C. Porter. *Treasurer*—G. Blacklock. *Hon. Secretary*—J. V. Ramsden.

'Evening Times' Camera Club.—(ESTABLISHED 1895.)—Meetings held at 46 Gordon Street, Glasgow. *President*—A. H. Duncan. *Vice-Presidents*—J. Blackwood, A. Neilson, G. Mason, A. L. Miller. *Treasurer*—John Fairie. *Secretary*—H. C. Shelley, 46 Gordon Street, Glasgow.

Exeter Amateur Photographic Society.—(ESTABLISHED 1890.)—Ordinary Meetings, first, third, and fourth Monday in the month from October to March, first Monday only from April to September, at eight p.m. Headquarters, City Chambers, Gandy Street, Exeter. *President*—Charles Cole. *Vice-Presidents*—J. W. Huggins, Rev. J. Sparshatt, W. Brock. *Council*—H. J. Stanbury, F. Green, F. C. R. Martin, A. W. Gregory, R. C. Fenwick, C. R. M. Clapp. *Hon. Librarian*—F. C. Pocknel. *Hon. Lanternist*—A. L. Honey. *Hon. Treasurer*—J. Hinton Lake. *Hon. Secretary*—W. Lloyd-Jones, Clevelands, Exeter.

Fairfield Camera Club.—(ESTABLISHED 1889.)—Meetings held at the Lecture Hall, Primitive Methodists' Chapel, Jubilee Drive, Kensington, Liverpool. *President*—T. E. C. Wilson. *Vice-President*—Harry Holt. *Council*—A. S. Allender, A. L. Bindloss, J. Colefield, H. Forrest, C. E. Haxcox, H. J. Mallabar, W. T. Sutton, W. J. Sutherland. *Treasurer*—S. H. J. Smith. *Secretary*—Frank H. Elsby, Rock Farm, Bebington.

Fakenham District Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lancaster Temperance Hotel, Fakenham. *President*—Rev. W. Martin, B.A. *Vice-Presidents*—Thomas Charlton, Algernon Digby, M.A., Rev. A. E. Humphreys, M.A. *Committee*—H. H. Charlton, H. R. C. Davis, R. W. Dewing, C. W. Horsley, F. W. Miller. *Secretary and Treasurer*—Henry Newson, The Square, Fakenham, Norfolk.

Falkirk Amateur Photographic Association.—(ESTABLISHED 1889.)—Meetings held at Newmarket Street. *President*—George Sherriff. *Vice-President*—T. T. Blackadder. *Committee*—Messrs. Ballantyne, Johnson, Lyon, Collins, and Hume. *Treasurer and Assistant Secretary*—W. C. Murray. *Secretary*—John Higgins, High Street, Falkirk.

Falmouth Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Boys' British School. *President*—W. M. Harrison. *Vice-Presidents*—Dr. Lidiard and E. Kitto, F.R.M.S. *Committee*—G. Lanyon, C. H. Palmer, — Brenton. *Treasurer*—Lieutenant Sugg, R.E. *Secretary*—J. McAllister McGill, 9 Albany Road, Falmouth.

Farnworth and District Photographical Society.—(ESTABLISHED 1892.)—*Committee*—Messrs. Gillibrand, Jones, Remfon, Morgan, and Ramsden. *Treasurer*—T. P. Brearley. *Secretary*—E. Warburton, Farnworth, Bolton.

Faversham Institute Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Faversham Institute. *President*—Right Hon. Earl Sondes. *Vice-Presidents*—Captain C. F. Hooper, W. C. Stunt, Dr. Evers. *Committee*—A. N. Filmer, F. C. Jackman, H. J. Browne, M. Laxon, C. Cremer, S. N. Smith. *Secretary and Treasurer*—Charles H. Semark, 25 Stone Street, Faversham.

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Forfarshire International Photographic Exhibition.—(ESTABLISHED 1892.)—*Hon. President*—Sheriff Robertson. *President*—Gilbert W. Don. *Hon. Vice-President*—Robert Whyte. *Vice-President*—James Watson Craik. *Treasurer*—Robert Bruce. *General Secretary*—W. J. Anckorn, West Port, Arbroath, N.B.

Glasgow and West of Scotland Amateur Photographic Association.—(ESTABLISHED 1883.)—Meetings held at 180 West Regent Street, Glasgow. *President*—A. Lindsay Miller. *Vice-President*—George Chalmers. *Council*—Arch. Watson, V. L. Alexander, James W. Ferguson, Stewart Smith, A. C. Todd. *Librarian*—N. G. Reid. *Treasurer*—William J. B. Halley. *Secretaries*—William Goodwin, 3 Lynedoch Street, Glasgow, and J. C. Oliver, 2 Royal Terrace, Glasgow.

Glasgow Photographic Association.—(ESTABLISHED 1862.)—*President*—John Stuart. *Vice-Presidents*—J. Craig Annan and A. Lindsay Miller. *Council*—W. J. M'Ilwrick, William Brown, George Mason, J. E. Hanbidge, James Gardner, William Lang, F.C.S. *Treasurer*—George Bell. *Secretary*—Frederick Mackenzie, 122 Wellington Street, Glasgow.

Glenalmond Photographic Club.—(ESTABLISHED 1890.)—Meetings held at Trinity College, Glenalmond, Perthshire. *President*—Arthur S. Reid, M.A., F.G.S. *Vice-Presidents*—Rev. J. H. Skrine (Warden of Glenalmond) and Gordon Caldwell. *Committee*—The Officers of the Club. *Librarian*—C. W. Andrewes. *Treasurer*—A. E. Pearson. *Secretary*—H. Todd, Trinity College, Glenalmond, Perthshire.

Glossop Dale Photographic Society.—(RE-ESTABLISHED 1883.)—Meetings are held at Norfolk Square, Glossop. *President*—Captain E. Partington, J.P. *Vice-Presidents*—Colonel Sidebottom, M.P., S. H. Wood, Mrs. S. Wood. *Treasurer*—J. Hardman. *Secretary*—T. W. Sharpe, 1 Pikes Lane, Glossop.

Gloucestershire Photographic Society.—(RECONSTRUCTED 1887.)—Meetings are held at the School of Science, Gloucester. *President*—G. Embrey. *Vice-President*—Henry S. Crump. *Committee*—A. H. Pomeroy, H. Pickford, W. Walwyn. *Treasurer*—Dr. Hodges. *Secretary*—Richard W. Dugdale, 17 Kingsholm, Gloucester.

Goldsmith's Institute Camera Club.—(ESTABLISHED 1891.)—Meetings held at Goldsmith's Institute. *President*—J. W. Penfold. *Vice-Presidents*—Arthur G. Bloxam, F.I.C., A. L. Spiller, F.R.P.S., Arthur Wood, B.A., J. S. Redmayne, B.A., Miss Griffiths. *Committee*—Miss Grinnett, Miss Davison, J. H. Jones, A. R. Forbes, W. G. Hodge, W. H. Sidgwick, A. A. Donald, A. H. Pook. *Treasurer*—C. G. S. Dawson. *Hon. Secretary*—H. W. J. Browse. *Assistant Hon. Secretary*—C. C. Toplis, Goldsmith's Institute, New Cross.

Goole Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Exchange, Goole. *President*—Robert Blair, J.P., M.D. *Vice-President*—T. C. Turton. *Committee*—Messrs. Turton, Medgley, Buck, Timms, Simpson, and Kettle. *Secretary*—S. Wells, Airmyn, Goole.

Gordon Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Gordon Club, Braintree. *President*—Herbert J. Cunnington. *Secretary*—W. Clark, Coggeshall Road, Braintree.

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Gospel Oak Photographic Society.—(Established 1894.)—Meetings held at the Congregational Schools, Lismore Road, Kentish Town. *President*—Rev. H. Le Pla. *Vice-President*—W. H. Rollason. *Committee*—W. Beyer, F. M. Davies, J. Gittens, F. H. Hall, J. Hingston. *Treasurer*—W. H. Rollason. *Secretary*—William Alfred Palmer, 13 Dale Road, Kentish Town, N.W.

Graphic Society, Plymouth.—(Established 1885.)—*President*—S. Kerswill. *Council*—E. H. Micklewood, W. Gage Tweedy, Miss Steele, Miss Gidley, Chairman, Treasurer, Secretary. *Treasurer*—G. F. Watson. *Secretary*—J. S. Hawker, J.P., Mutley House, Plymouth.

Great Yarmouth Amateur Photographic Association.—(Established 1893.)—Meetings are held fortnightly on Monday evenings, at the Two Bears Hotel, Southtown, Great Yarmouth. *Secretary and Treasurer*—George T. Davis, 4 Market Place, Great Yarmouth.

Great Yarmouth Camera Club.—(Established 1891.)—Meetings held at The Tower, Gorleston, Great Yarmouth. *President*—Dr. J. Adcock. *Committee*—P. Wiltshire, F. Danby Palmer, A. Price. *Treasurer*—John Taylor. *Secretary*—H. Harvey George, The Tower, Gorleston, Great Yarmouth.

Greenock Camera Club.—(Established 1888.)—Meetings are held on the third Thursday of each month, at half-past Seven p.m., from September to April inclusive, in the Museum, Kelly Street, Greenock. *President*—Matthew Blake. *Vice-President*—T. A. Cunningham. *Council*—George Dunlop, R. S. Gilmour, J. A. Stirling. *Lanternist*—R. W. Jamieson. *Treasurer*—Alexander Bathgate. *Secretary*—John Paul, 28 Esplanade, Greenock.

Grimsby and District Photographic Society.—(Established 1894.)—Meetings held at 28 Victoria Street, Grimsby. *President*—R. C. Long. *Vice-Presidents*—Dr. Simpson, H. Barker, A. Langridge. *Committee*—J. H. Clayton, W. H. Marris, Rev. H. W. Knight, C. Wilmot, J. A. Marris, T. E. Gale, W. Brumpton, J. T. Tuxworth, A. Hewitt, J. T. Botherill, C. Dewing. *Treasurer*—A. E. Matthews. *Secretary*—Alfred T. Flint, 5 West Prospect, Ainslie Street, Grimsby.

Guildford Photographic Society.—(Established 1890.)—Meetings held at 36 High Street, Guildford. *President*—The Right Hon. the Earl of Onslow, G.C.M.G. *Vice-Presidents*—G. J. Jacobs, J. Russell, Sir J. F. Leese, Q.C., M.P. *Council*—R. W. Fielder, T. L. Inman, A. J. Moon, G. C. Williamson. *Treasurer*—J. H. Nunn. *Secretary*—A. E. Moon, 36 High Street, Guildford.

Hackney Photographic Society.—(Established 1889.)—Meetings held at the Pembury Hotel, Amhurst Road. Annual Meeting, May. Exhibition every November. *President*—E. J. Wall. *Council*—R. Beckett, W. L. Barker, A. Barker, F. Houghton, E. Puttock, L. S. Wilks, F. W. Gosling, Dr. Roland Smith. *Hon. Lanternist*—A. Rose. *Librarian*—A. Dean. *Treasurer*—J. O. Grant. *Secretary*—W. F. Fenton-Jones, 12 King Edward Road, Hackney. *Hon. Assistant Secretary*—A. D. Fort.

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Halifax Camera Club.—(Reorganized, 1895.)—Meetings held at Crossley Street, Halifax. *President*—J. I. Learoyd. *Vice-Presidents*—James Bramley and B. Bingley. *Committee*—C. Foster, T. Wardle, J. W. Holland, J. T. Wood, G. H. Hodgson, G. Dyson. *Secretary and Treasurer*—Arthur Priestley, 7 Commercial Street, Halifax.

Halifax Photographic Club.—(Established 1881.)—Meets the last Thursday in each month in the Mechanics' Hall at half-past Seven, p.m. *President*—B. Rowley. *Vice-Presidents*—T. Illingworth and E. J. Smith. *Council*—B. B. Bingley, Major Holroyde, H. Mossman, Councillor S. Smith, Joseph Whiteley, together with the Officers. *Auditor*—S. Goodman. *Treasurer*—E. H. Child. *Hon. Secretary*—W. Clement Williams, 13 Aked's Road, Halifax.

Haltwhistle and District Photographic Society.—(Established 1889.)—Meetings are held at Haltwhistle. *President*—Dr. W. R. Spiers. *Vice-President*—George Clark. *Secretary and Treasurer*—David Macadam, Carlisle City and District Bank, Haltwhistle.

Handsworth Photographic Society.—Meetings are held at 18 Albert Road, Handsworth. *President*—P. Whitehouse. *Vice-Presidents*—Dr. Foster, — Freeland, C. F. Jarvis, E. J. Timings. *Council*—G. Owen, W. J. Morgan, — Richardson, L. Lloyd, — Pettit, W. J. Foster, — Garman, V. Bamber. *Treasurer*—C. L. Stait. *Secretary*—W. M. Jones.

Haslingden and District Amateur Photographic Society.—(Established 1894.)—Meetings held at the Institute, Haslingden. *President*—Henry A. Smith. *Vice-President*—Thomas F. Bradbury. *Committee*—W. H. Blayney, Robert Brown, — Gregory, Israel Grimshaw. *Secretary and Treasurer*—Edward Anderton, 326 Manchester Road, Haslingden.

Hastings and St. Leonards Photographic Society.—(Established 1888.)—*Secretary*—Algernon Brooker, 21a Wellington Place, Hastings.

Helios Postal Photographic Club.—(Established 1887.)—A Postal Photographic Club, circulating portfolios amongst the members for the insertion of photographs, which are mutually criticised upon forms supplied for the purpose. The Club possesses two portfolios, and the circulation is so arranged that each member receives one every month. *Hon. Secretary and Treasurer*—Henry Everett, 125 St. Paul's Road, Bow, London, E.

Herefordshire Photographic Society.—(Established 1888.)—*President*—Alderman T. Blake, J.P. *Vice-Presidents*—A. Watkins, T. J. Salwey, J. Parker, C.E., W. M. Wilson, Rev. G. H. Morgan. *Council*—E. G. Davies, E. W. H. Chave, A. C. Edwards, A. E. Elliott, R. Clarke, C. H. Woodhouse, E Stephens, E. Horth, A. C. Slatter, W. Groom. *Treasurer*—W. E. Haines. *Secretary*—Cecil Gethen, 9 St. Nicholas Street, Hereford.

Hexham Photographic Society.—(Established 1892.)—*President*—Charles F. Straker. *Vice-Presidents*—Jasper Gibson, Charles Liddell, Lewis C. Lockhart. *Council*—Stanley A. Bowman, John Gibson, Banas R. Reed, T. W. Wheatley. *Treasurer*—Ed. C. Spencer. *Secretary*—J. Frederick Russell, 33 Hallstill Bank, Hexham.

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Highland Photographic Society.—(ESTABLISHED 1895.)—Meetings held in the Studio, 21 Inglis Street, Inverness, on first and third Thursdays of every month. *President*—John Mackenzie. *Vice-Presidents*—Louis Macleod and John S. Nicholls. *Council*—Messrs. Mayne, Walker, Barron, Sinclair, Bethune, Dallas, and Sutherland. *Secretary and Treasurer*—Alexander F. Mackenzie, 15 Union Street.

Holborn Camera Club.—(ESTABLISHED 1889.)—Place of Meeting, 100 High Holborn, London, W.C. *President*—D. R. Lowe. *Vice-Presidents*—Fred. Brocas, S. T. Chang, F. Knights. *Committee*—H. Cobb, A. Hodges, F. J. Cobb, E. Hodges, H. Thompson, H. Trayfoot. *Treasurer*—Albert Bell. *Secretary*—J, Brittain, 52 Hilldrop Road, Camden Road, N.

Holmfirth Amateur Photographic Association.—(ESTABLISHED 1885.)—*President*—Arthur Preston. *Secretary and Treasurer*—David Bilson, Birchin House, Holmfirth.

Hove Camera Club.—(ESTABLISHED 1892.)—Meetings are held in Hove Town Hall. *President*—G. B. Woodruff, J.P. *Vice-Presidents*—W. Ainslie Hollis, M.D., H. H. Taylor, F.R.C.S., A. J. Richardson, M.D., Charles Job. *Committee*—Messrs. Ford, Stoner, Caithness. *Treasurer*—J. Williamson. *Secretary*—E. E. Mainwaring, 73 Lansdowne Place, Hove.

Huddersfield Naturalist and Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Y.M.C.A. Lecture Room. *President*—H. G. Brierley. *Vice-Presidents*—Councillor F. Crossland and T. W. Woodhead. *Treasurer*—A. W. Whiteley. *Secretary*—A. Clarke, 9 St. Andrew's Road, Huddersfield.

Hull Photographic Society.—(ESTABLISHED 1884.)—Meetings held at the Club Room, 71 Prospect Street, Hull. *President*—J. Pybus. *Vice-Presidents*—W. Hay-Fea and A. H. White. *Hon. Lanternists*—Dr. J. Walker and A. H. Spaven *Hon. Treasurer*—W. Lythe. *Hon. Secretaries*—J. Saunders and T. Straker.

Ilkeston Photographic Society.—(ESTABLISHED 1891.)—*President*—Dr. Carroll. *Treasurer*—George Woolliscroft. *Secretary*—W. Shakspeare, Arden Villas, Gregory Street, Ilkeston.

Ipswich Scientific Society (Photographic Section).—(ESTABLISHED 1888 as Ipswich Photographic Society, 1895 remodelled as a Section.)—Meetings held at the Museum, Ipswich. *President*—S. A. Notcutt, B.A., B.Sc. *Committee*—W. Vick, E. P. Ridley, W. C. Block, J. S. Corder, J. Napier, G. H. Hewetson. *Treasurer*—H. Muller *Secretary*—F. Woolnough (Sectional), Museum, Ipswich.

Keighley and District Photographic Association.—(ESTABLISHED 1889.)—Meetings held at the Mechanics' Institute, North Street, Keighley. *President*—Alexander Keighley. *Vice-Presidents*—Rev. A. Clarke and John Beaver. *Committee*—Samuel Bairstow, J. G. Dickinson, William Hainsworth, Ellis Myers, Thomas Heaps, J. Sharp, Charles Smith, James Waters. *Treasurer*—Walter Mitchell. *Secretary*—John Gill, 27 Highfield Lane, Keighley.

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Kendal Literary and Scientific Institution (Photographic Section).—(Established 1886.)—Meetings held at the Museum Library, Kendal. *President*—Gilbert Gilkes, C.E. *Committee*—Joseph Severs, Hon. Secretary of the Institution, E. Boundy, T. Sharpe, J. Sawyers, T. N. Ritson, George R. Hargreaves, jun., and President. *Treasurer*—T. N. Ritson. *Secretary*—George Richard Hargreaves, jun., Finkle Street, Kendal.

Kilmarnock and Ayrshire Photographic Society.—(Established 1887.)—Meetings are held at Kilmarnock and Ayr every alternate month. *President*—J. Mack Wilson. *Vice-President*—Robert Gudgeon. *Council*—J. Mack Wilson, Robert Gudgeon, Thomas Ferguson, Alfred James Thompson, Robert Terras, George Paxton, Robert Boyd. *Secretary and Treasurer*—William Paterson, Beech Cottage, Northfield Avenue, Ayr.

King's Lynn Photographic Society.—(Established 1894.)—Meetings held at the Church of England Y.M. Society's Rooms. *President*—G. W. Page. *Vice-Presidents*—Rev. H. H. Streeten and C. W. Croad, J.P. *Committee*—W. H. Cockle, W. Smalley, A. H. Crisp, A. Taylor, J. Clough. *Secretaries and Treasurers*—H. Tilson and E. A. Simkins, Railway Road, Lynn.

King's Lynn Y. M. C. A. Photographic Club.—(Established 1891.)—Meetings held at the Y.M.C.A. Rooms, St. James's Street. *President*—G. M. Bridges. *Committee*—W. E. Daw, W. Hides, W. Lock. *Secretary and Treasurer*—William Winch, St. James's Street, King's Lynn.

Kingsbridge Photographic Society.—(Established 1894.)—Meetings held at St. Edmund's Hall, Duncombe Street. *President*—Rev. J. Henning. *Committee*—W. R. Beer, W. R. Gay, B. Chaffey, W. J. Tucker. *Secretary and Treasurer*—R. McAll Stewart, 56 Fore Street, Kingsbridge.

Kingston-on-Thames and District Photographic Society.—(Established 1893.)—Meetings held at 10 Palmer Crescent, Kingston-on-Thames. *President*—Rev. G. I. Swinnerton. *Vice-Presidents*—Rev. F. C. Lambert and W. Montagu Robertson. *Committee*—C. E. Abney, George Cowen, M.D., Albert Hill, S. Wilson, A. Vandendreisch. *Treasurer*—W. Montagu Robertson. *Secretaries*—Dr. Finny, Kenlis, Kingston Hill, Surrey, and W. E. Price, Bushey View, Hampton Wick, Middlesex.

Lake District Camera Club.—(Established 1895.)—Meetings held at the Lake District Camera Club, Windermere. *President*—J. R. Bridson, J.P., F.R.A.S. *Vice-Presidents*—Major Dunlop, M.A., J.P., Paul Lange, G. H. Rutter. *Treasurer*—Lieut.-Colonel Reade. *Secretaries*—Fred. B. Cattley, Hazelwood, Windermere, and W. H. R. Kerry, Wheatland, Windermere.

Lancaster Photographic Society.—(Established 1889.)—Meetings held at Stonewell, Lancaster. *President*—Alan Garnett. *Vice-Presidents*—J. W. Pickard and H. J. J. Thompson. *Committee*—A. S. Barling, N. Holden, R. W. Wearing, J. Crane. *Treasurer*—W. Massey. *Secretary*—W. Briggs, 21 Cheapside, Lancaster.

Lantern Slide Exchange Club.—(Established 1889.)—A postal photographic society for the circulation of lantern slides. *Secretary and Treasurer*—A. J. Richardson, Summerville, Dore, near Sheffield.

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Lantern Society.—(ESTABLISHED 1890.)—*President*—The Hon. Slingsby Bethell, C.B. *Chairman*—J. J. Vezey, F.R.M.S. *Vice-Chairman*—T. H. Holding. *Council*—G. G. Baker-Cresswell, F. H. Evans, C. E. Gladstone, E. K. Hall, W. H. Maw, F.R.M.S., E. M. Nelson, F.R.M.S., J. W. Reed, A. R. Sheppee. *Curator*—J. W. Ashdown. *Hon. Secretary*—William Bashall, 21 Holland Villas Road, London, W.

Leamington Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Pump Room, Leamington. *Hon. President*—Surgeon-General Ranking. *Committee*—Dr. Harold Mason, J. Ross Watt, J. W. Green, Rev. Ed. Healy, the Hon. Secretary. *Treasurer*—B. Magrath. *Hon. Secretary*—Signor Aspa, Priory House, Leamington.

Leeds Camera Club.—(ESTABLISHED 1893.)—Meetings held at Brayshay's Restaurant, Bond Street, Leeds. *Patrons*—The Right Hon. Baron Playfair, the Right Hon. H. J. Gladstone, M.P., G. W. Balfour, M.P., the Right Hon. W. L. Jackson, M.P., T. R. Leuty, M.P., J. Lawson Walton, Q.C., M.P., His Worship the Mayor of Leeds (Alderman P. Gilston, J.P.), Professor T. E. Thorpe (London), F.R.S., Sir George Irwin, Councillor J. Gordon, J.P., W. Warren, J.P. *President*—Dr. J. T. Thresh, M.A., Ph.D., L.R.C.P., L.F.P.S.G., L.S.A.L., &c. *Vice-Presidents*—Major W. Norwood, Councillor J. Green Hirst, Rev. J. Beanland, W. R. Irwin, A. Homburg. *Committee*—W. A. Daniel, G. Dixon, W. Hesling, C. B. Hutchinson, A. Oddy, C. C. Vevers, G. Wright. *Hon. Lanternist*—A. Oddy. *Treasurer*—T. R. Thompson. *Hon. Secretaries*—H. F. Wigglesworth, 66 Wellington Street, Leeds, and Primrose Cottage, Armley, and S. Barnes, 16 Lady Lane.

Leeds Photographic Society.—(ESTABLISHED 1852.)—Meetings held at the Mechanics' Institute. *President*—John H. Walker. *Vice-Presidents*—B. A. Burrell, F.I.C., and W. J. Warren. *Committee*—A. W. Atkinson, H. P. Atkinson, A. Naylor, B. A. Burrell, Thomas Coombs, Herbert Denison, R. W. Savage, J. W. Reffitt, J. H. Walker, W. J. Warren. *Treasurer*—Herbert Denison. *Secretaries*—Herbert Denison and Thomas Coombs, 26 and 27 Bond Street, Leeds.

Leicester and Leicestershire Photographic Society.—(ESTABLISHED 1885.)—Meetings held in the Mayor's Parlour, Old Town Hall. *President*—Samuel Squire. *Vice-President*—Richard Ralph Blackwell. *Committee*—George Bankart, J. Porritt, J. Toon, W. S. Hubbard, — Howard. *Treasurer*—Joseph Toon. *Secretary*—Henry Pickering, High Cross Street, Leicester.

Leigh Photographic Society.—(ESTABLISHED 1892.)—Meetings are held in the Old Grammar School, Market Place. *President*—Miles F. Burrows, *Vice-Presidents*—T. L. Syms, J. Ward, B.A., J. H. Stephen, R. B. Mawson, T. Peters, W. Hampson *Committee*—J. Battersby, J. Berry, W. Crouchley, T. G. Hirst, R. Leigh, T. Mercer, P. Seddon. *Treasurer*—T. Haddock. *Secretary*—W. R. Moore, 17 Railway Road, Leigh.

Leith Amateur Photographic Association.—(ESTABLISHED 1888.)—Meetings held at 165 Constitution Street, Leith. *President*—Robert Hunter. *Vice-President*—Robert C. Ewart. *Council*—Messrs. Dewar, Puthrie, Davies, Hendrie, Hislop, Seater, Forgie, Wilson, Smith. *Treasurer*—M. Campbell. *Secretary*—Alexander Pitkethly, 8 Wilkie Place, Leith.

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Lewes Photographic Society.—(Established 1888.)—Meetings held at the Fitzroy Library, Lewes. *President*—His Worship the Mayor (Councillor Wightman). *Vice-President*—J. Tunks. *Committee*—E. J. Bedford, Councillor Lyell, W. E. Nicholson, C. A. Wells, W. J. Young, with President, Vice-President, and Secretary. *Secretary and Treasurer*—George Carpenter, 81 High Street, Lewes.

Lewisham Camera Club.—(Established 1890.)—Meetings held at the Lecture Hall of the Lewisham High Road Church. *President*—Rev. I. Morley Wright. *Vice-Presidents*—C. J. Darling, Q.C., M.P., W. J. Dibdin, F.I.C., F.C.S., Professor C. J. Lambert, M.A., F.R.A.S., A. H. Miles, M. Stoddart. *Committee*—W. C. Chaffey, C. Churchill, H. L. Davis, B. Davidson, W. L. Gray, C. Lanchester. *Treasurer*—E. B. Eastwood. *Joint Hon. Secretaries*—E. Eastwood, 47 Tressillian Road, Brockley, S.E., and H. M. C. Sprunt, 192 New Cross Road, S.E.

Leytonstone Camera Club.—(Established 1891.)—Meetings held at the Studio, Assembly Rooms, Leytonstone. *President*—Dr. W. Pickett Turner, E.C.C. *Vice-Presidents*—E. Widdrington Byrne, Q.C., M.P., W. B. Whittingham, J.P., A. Horsley Hinton, T. F. Sanderson, D. J. Morgan. *Council*—C. Andrews, A. E. Bailey, W. J. Battell, G. E. Cox, A. C. T. Frost, B. Harwood, C. A. Russell, G. Tabor, A. P. Wire, J. Woodcock. *Treasurer*—Tom Symmons. *Secretaries*—Frederick W. Wates and George H. Cricks, Rockcliffe, Bulwer Road, Leytonstone, London, E.

Light and Truth Postal Photographic Club.—(Established 1890.)—The objects of this Club are the mutual instruction and recreation of its members, by the circulation through the post of photographs produced by them, for criticism, exchange, &c., and also the discussion of photographic subjects. *Secretary and Treasurer*—Henry E. Trew, A.P.S., 139 Cheltenham Road, Bristol.

Lincoln Camera Club.—(Established 1892.)—Meetings held at the School of Science and Art, Monks Road, Lincoln. *President*—Rev. Canon Fowler. *Vice-President*—Henry Mantle. *Committee*—C. Watkin, J. Birkbeck, George Howard, C. Nelson, A. Fieldsend, F. W. Key, J. H. Cooke, F.G.S. *Treasurer*—Captain J. M. Warrener. *Secretary*—W. E. Asquith, 24 Altham Terrace, St. Catherine's, Lincoln.

Liverpool Amateur Photographic Association.—(Established 1863.)—Meetings held at Percy Buildings, Eberle Street, Liverpool. *President*—George B. Newton. *Vice-Presidents*—J. Sirett Brown and W. Prior Christian. *Council*—William Tomkinson, E. V. Swinden, Joseph Earp, J. T. Norman-Thomas, A. J. Cleaver, Dr. J. W. Ellis, F.E.S., H. Holt, H. Lupton, T. F. Lloyd, A. Tyrer, Paul Lange, F. Anyon, J. H. Welch, Rev. W. Smith. *Treasurer*—P. H. Phillips. *Secretary*—F. A. Schierwater, Percy Buildings, Eberle Street, Liverpool.

Liverpool Camera Club.—(Established 1891.)—Meetings held at 128a Mount Pleasant, Liverpool. *President*—John Pride. *Vice-Presidents*—James Hawkins and Matthew Wells. *Council*—W. A. Stuart, F. V. A. Lloyd, H. Handley, C. H. Freeman, T. F. Carter, H. G. Evans, W. H. Griffiths, W. A. Brown, E. N. Ellis. *Librarian*—J. Parish. *Treasurer*—S. J. Rowe. *Secretary*—William Tansley, 14 Wentworth Street, Liverpool.

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Liverpool Physical Society (Photographic Section).—(ESTABLISHED 1891.)—Meetings are held at University College, Liverpool. *President*—Dr. F. Hurter. *Treasurer*—C. Defieux. *Secretary*—Dr. Charles A. Kohn, University College, Liverpool.

Llandudno Camera Club and Lantern Society.—(ESTABLISHED 1892.)—Meetings held at the Club House, Bodhyfryd Walks, Llandudno. *President*—Right Hon. Lord Mostyn. *Vice-Presidents*—Rev. John Morgan, M.A. and W. A. Whiston. *Committee*—J. S. Cornaby, R. Eccles, H. H. Watterson, R. Hughes Jones, J. Dean. *Secretaries and Treasurers*—A. Campbell, Anneddle, Llandudno, and A. H. Hughes, Rochester House, Llandudno.

London and Provincial Photographic Association.—(ESTABLISHED 1882.)—Meetings held at the Champion Hotel, 15 Aldersgate Street, London, E.C. *Trustees*—J. Traill Taylor and J. B. B. Wellington. *Committee*—E. H. Bayston, Thomas Bedding, J. Weir Brown, E. J. Wall T. E. Freshwater, F.R.M.S., E. W. Parfitt, J. S. Teape. *Curator*—A. Haddon. *Recorder*—G. W. Atkins. *Librarian*—J. E. Hodd. *Secretary and Treasurer*—Philip Everitt, 88 Evering Road, N.

Longton and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Grafton Road Schools. *President*—Rev. W. I. Smith. *Vice-Presidents*—T. P. Hulse and G. Hawley. *Committee*—J. Bold, E. Todd, R. Prince, S. Jackson, A. Bott, A. R. Miller. *Treasurer*—S. Ashcroft. *Secretary*—George Turner, 19 Market Street, Longton. *Assistant Secretary*—T. Mottershead, Stafford Street, Longton.

Loughborough Amateur Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Society's Rooms, Church Gate. *President*—Walter C. Burder. *Vice-President*—Alfred D. Bartlett. *Committee*—E. Sillar, W. C. Burder, A. D. Bartlett. Kenneth Watson, W. Clarke, H. Kelsey, A. Brotherton. *Secretaries*—Henry Kelsey, Cobden Street, and William Clarke, Forest Road.

Loughborough Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Photographic Rooms, Church Gate. *President*—W. C. Burder. *Vice-Presidents*—A. D Bartlett and G. Sillar. *Committee*—Messrs. Burder, Bartlett, Brotherton, Colgrove, Clarke, Hepworth, Kelsey, Watson, and Yeomans. *Treasurer*—Henry Kelsey. *Secretaries*—H. Kelsey and W. Clarke, Cobden Street, Loughborough.

Louth and District Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 8 Upgate, Louth, Lincolnshire. *President*—F. J. Ingoldby. *Committee*—Rev. J. M. Coates, Rev. — Standen, J. V. Crow, Mrs. Clarence James, A. Plaskett, Walter Shephard. *Treasurer*—E. J. Forman. *Hon. Secretary*—S. Francis Clarke, L.D.S., 8 Upgate, Louth. *Hon. Assistant Secretary*—H. C. Bentley, Bridge Street, Louth, Lincolnshire.

Lyonsdown Amateur Photographic Association.—(ESTABLISHED 1886.)—Meetings held at members' houses. *President*—Frank Crosbie. *Vice-President*—T. Samuels. *Treasurer*—Harold Imray. *Secretary*—Walter Crosbie, The Chestnuts, Lyonsdown, New Barnet.

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Maidstone Amateur Photographic Club.—(ESTABLISHED 1888.)—Meetings held at the Old Palace, Maidstone. *President*—J. E. Austin. *Committee*—H. Bear, F. Laurence, L. Green, J. H. Bridge, *Secretary and Treasurer*—R. P. Grant, Shirley House, Maidstone.

Manchester Amateur Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Manchester Athenæum. Dark Room, Reading Room, and Library, 15 Brazennose Street. *President*—R. O. Gilmore. *Vice-Presidents*—J. G. Jones, J. T. Lees, H. Smith, J. W. Wade. *General Committee*—E. Ashman, F. W. Burton, S. L. Coulthurst, J. Davenport, T. Glazebrook, J. W. Hadfield, G. M. Little, E. F. Prince, James Shaw, H. Sykes, E. H. Turner, J. W. Young. *Sub-Committees*—Record: S. L. Coulthurst, J. Davenport, R. O. Gilmore, J. T. Lees, J. W. Wade (Hon. Secretary); Society's Rooms and Demonstrations: T. Glazebrook, J. W. Hadfield, E. F. Prince, E. H. Turner, J. W. Young, E. Ashman (Hon. Secretary); Survey: C. Dawson, G. M. Little, H. Smith, S. L. Coulthurst (Hon. Secretary); Lantern: T. Glazebrook, J. G. Jones, F. W. Parrott, E. H. Turner, J. W. Wade, J. Davenport (Hon. Secretary). *Librarian*—F W. Burton. *Editor of Magazine*—Henry Sykes. *Hon. Treasurer*—C. Dawson. *Secretary*—F. W. Parrott, Ashfield Road, Altrincham.

Manchester Camera Club.—(ESTABLISHED 1885.)—Meetings held at the Victoria Hotel, Manchester. *Committee*—J. Davenport, W. Hepburn, J. T. Foster, J. W. Wade, J. T. Overmann. *Treasurer*—J. Davenport. *Secretary*—Charles Dawson, 66 Peter Street, Manchester.

Manchester Photographic Society.—(ESTABLISHED 1855.)—Meetings held at 36 George Street, Manchester. *President*—H. M. Whitefield. *Vice-Presidents*—F. W. Andrew, A. Brothers, F.R.A.S., F. W. Burt, T. Chilton, F. Edwards. *Council*—C. H. Coote, S. L. Coulthurst, J. Hyde H. V. Lawes, W. Tomlinson, H. Wade, J. Warburton, J. Whittaker, J. C. Wolfenden. J. W. Young. *Lantern Committee*—F. Edward, W. Tomlinson, J. Whittaker, J. C. Wolfenden. *Curator*—J. Whittaker. *Librarian*—C. H. Coote. *Treasurer* — W. G. Coote. *Secretary* (*pro tem.*)—A. E. Casson, 18 Burlington Road, Withington.

Manchester Y.M.C.A. Photographic Club.—(ESTABLISHED 1890.)—Meetings held at 56 Peter Street, Manchester. *President*—G. T. White. *Vice-President*—W. H. Newett. *Committee*—A. C. Harrison, W. H. Machin, J. Irvine, R. Chapman, A. W. Pearson. *Treasurer*—Irving Hume. *Secretary*—George Dixon, 56 Peter Street, Manchester.

Midland Camera Club.—(ESTABLISHED 1891.)—Meetings held at the Medical Institute, Edmund Street, Birmingham. *President*—H. R. Leech, M.R.C.S, J.P. *Vice-Presidents*—Hall-Edwards, L.R.C.P., Councillor Lancaster, C. Jevons Fowler. *Council*—T. H. Cox, J. Donaghue, William Dudley, M.R.C.S., T. J. Perry, T. Smallwood. *Hon. Treasurer*—R. J. Bailey. *Hon. Secretary*—H. Cooper, 47 Hagley Road, Edgbaston.

Midlothian Camera Club.—(ESTABLISHED 1889, REORGANIZED 1893.)—Meetings are held on fourth Monday of each month, October to April, in the Lecture Hall, Philosophical Institute, 4 Queen Street, at half-past Eight, p.m. *President*—Hugh Marshall, D.Sc. *Vice-Presidents*—Alexander Calder and D. Bruce Peebles. *Council*—Alexander Thomson, Campbell-Hossack, R. C. Ewart, D. Frater, J. A. Turner. *Treasurer*—W. C. Callender. *Secretary*—A. D. Guthrie, Bonnington, Edinburgh.

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Monklands Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the New Library Buildings, Anderson Street, Airdrie. *President*—Robert Dunlop. *Vice-President*—Frank Robertson. *Committee*—John W. Eadie, Walter Brown, jun., Thomas A. McFarlane, James S. Lavie, John Sheil. *Treasurer*—Samuel H. Wood. *Secretary*—William Dixon Gray, 16 Bank Street, Airdrie.

Munster Camera Club.—(ESTABLISHED 1891.)—Meetings held at the School of Art, Nelson Place, Cork. *President*—K. B. Williams. *Vice-Presidents*—R. S. Baker, John Day, Ringrose Atkins, M.D., Major T. D. Lysaght, A.P.D., H. S. Noblett. *Committee*—W. R. Atkins, H. Schröter, J. McKechnie, E. Scott, C. H. Peame, H. Lund, J. Bennett, John Day, J. Murphy, A. Roche, G. Percival, J. O'Connell. *Treasurer*—John Day. *Secretaries*—Ernest Scott and C. H. Pearne.

National Association of Professional Photographers of Great Britain and Ireland.—(ESTABLISHED 1891.)—Places of Meeting, in London, November 9th, also in large Provincial towns periodically, as decided on by Annual Meeting in February each year. *President*—W. Barry (Hull). *Vice-Presidents*—J. Crosby (Rotherham), T. Fall (London), C. Lafosse (Ilfracombe), R. Slingsby (Lincoln), H. J. Whitlock (Birmingham). *Committee*—Harold Baker (Birmingham), T. Birtles (Warrington), Boak & Sons (Driffield), W. J. Byrne (Richmond), Chancellor & Son (Dublin), W. Davey (Harrogate), J. E. Eddison (Barnsley), J. Fergus (Largs, Scotland), Thomas Forrest (Pontypridd, South Wales), William Gill (Colchester), R. P. Gregson (Blackburn), Guy & Co. (Cork), G. Higginson (Bowdon), T. Illingworth (Halifax), R. Keene (Burton-on-Trent), T. N. Langton (Sheffield), Jno. Martyn (Southwold), Donald McIver (Leeds), H. J. Mendelssohn (London), John Moffatt (Edinburgh), Van der Weyde (London), F. Whaley (Doncaster), G. V. Yates (Sheffield). *Auditors for* 1895—Harold Baker (Birmingham) and John A. Draycott (Birmingham). *Hon. Treasurer*—W. Brookes (Manchester). *Hon. Secretary*—T. Bromwich (Bridgnorth). *Secretary*—D. J. O'Neill, 47 Charlotte Road, Birmingham.

Newcastle-on-Tyne and Northern Counties' Photographic Association.—(ESTABLISHED 1881.)—Meetings held at the Art Gallery, Newcastle-on-Tyne. *President*—J. Pattison Gibson. *Vice-Presidents*—J. S. B. Bell, W. Parry, J. Hedley Robinson, John Watson. *Council*—Dr. Blacklock, W. E. Cowan, Wm. Graham, George Hall, J. J. Kirkwood, E. G. Lee, T. O. Mawson, Captain Sayers, G. L. Snowball, Wm. Thompson. *Treasurer*—Frederick Park. *Secretary*—James Brown, 31 Market Street, Newcastle-on-Tyne. *Assistant Secretary*—Parker Brewis.

Newton Heath Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Wesleyan School, Oldham Road. *President*—W. T. Evans. *Vice-Presidents*—R. Fallows and W. H. Rowbotham. *Committee*—A. Andrew, W. B. Evans, F. Hopwood, J. Winterbottom, W. H. Collier. *Treasurer*—J. Moodie. *Secretary*—J. Fortune, Oldham Road, Newton Heath.

Newtownards Camera Club.—(ESTABLISHED 1894.)—Meetings are held at Regent Street Hall, Newtownards. *President*—Hugh Conway, B.A. *Vice-President*—S. H. Simms. *Committee*—Miss Ledlie, Mrs. Conway, A. H. Moore, T.C., S. Paden, Q.C., S. Jones. *Treasurer*—William McCullough. *Secretary*—Thomas Drake, Conway Square, Newtownards.

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Norfolk and Norwich Camera Club.—(ESTABLISHED 1886.)—Meetings held at the Bell Hotel, Norwich. *President*—J. Algar. *Vice-Presidents*—Dr. Thompson and Harvey George. *Committee*—Messrs. Davies, Latham, Bidwell, and Alston. *Secretary and Treasurer*—Colonel H. Wood, C.B., 63 Thorpe Road, Norwich.

Northamptonshire Natural History Society and Field Club (Photographic Section)—(ESTABLISHED 1876.)—Meetings are held at the Town Museum. *President*—H. Manfield. *Secretary*—Joseph J. Wetherell, Billing Road, Northampton.

North Kent Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Medical Hall Rooms, Milton Road, Gravesend. *Vice-President*—E. J. Wall. *Chairmen*—Rev. J. Haslam, J. C. Johnson, J.P., Rev. George Barr, Rev. Augustine Briggs, M.A. *Council*—Percy J. Boorman, Horatio Sandford, B. L. Rankin, F. H. Wells, Thomas Nettleingham, S. R. Macartney, G. W. Cobham. *Treasurer*—J. H. Morris. *Secretary*—Thomas L. Winnett, 5 The Grove, Gravesend.

North London Photographic Society.—(ESTABLISHED 1885.)—Meetings are held at Canonbury Tower, N. *President*—J. Traill Taylor. *Council*—W. Bishop, J. Brewer, J. Douglas, W. Few, Rev. E. Healy, E. W. Parfitt. *Secretary and Treasurer*—W. T. Coventon, 50 Highbury Park, N.

North Middlesex Photographic Society.—(ESTABLISHED 1886.)—Meetings held at Jubilee House, Hornsey Road, London, N. *President*—J. C. S. Mummery. *Vice-Presidents*—C. Beadle and S. E. Wall. *Council*—Messrs. Dawkins, Golding, Goodwin, Gregory, Johnson, Lisett, Mattocks, Pither, Spencer, Stuart, and Walker. *Librarian*—F. W. Cox. *Treasurer*—H. Smith. *Assistant Secretary*—W. J. Simpson, 10 Clerkenwell Road, London, E.C.

North Surrey Photographic Society.—(ESTABLISHED 1887.)—Meetings are held every alternate Tuesday at the Institute, Knight's Hill Road, West Norwood, S.E. *President*—J. Morrish. *Vice-President*—L. Wolff. *Council*—W. H. Baldwin, T. J. Bright, F. Chambers, J. G. Dalzell, F. Fitzpayne, P. Toucard, E. C. Hertslet. *Secretary*—R. W. Wilson, 42 Norwood Road, S.E.

Nottingham Mechanics' Institution Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Mechanics' Institution, Nottingham. *President*—His Grace the Duke of Newcastle. *Vice-Presidents*—Colonel Seely, W. J. Abel, B.A., S. Bourne, J.P., A. Brown, M.I.C.E., J. A. H. Green, J. Harrison, A. Pyatt, C. B. Wright, G. H. Wallis, F.S.A., R. L. Warham. *Committee*—Mrs. Fraser, Miss Clarke, F. W. Fewkes, J. Forrester, A. R. Hartley, R. G. Holbrook, J. Radford. *Treasurer*—E. W. Wilson. *Secretary*—William Edgar, C.E., 123 Clinton Terrace, The Park, Nottingham.

Oban Amateur Photographic Society.—(ESTABLISHED 1892.)—Place of Meeting, Oban. *Hon. President*—J. B. Atkinson. *Hon. Vice-President*—W. Campbell Muir. *President*—M. A. Scott. *Vice-President*—John Maclaine. *Committee*—President, Vice-President, Secretary and Treasurer, D. Campbell Munro, John Anderson, jun. *Secretary and Treasurer*—Samuel Lawrence, Chemist, Oban.

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Oldham Photographic Society.—(ESTABLISHED 1867.)—Meetings held at the Oldham Lyceum, Union Street, Oldham. *President*—Joseph S. Dronsfield, J.P. *Vice-President*—James Brooks. *Committee*—S. Ashton, J. Chadwick, J. Greaves, jun., James Hall, B. J. Holt, W. Thompson, T. Burton, F. Megson. *Treasurer*—J. H. Ashton. *Secretary*—Thomas Widdop, 17 Queen Street, Oldham.

Oxford Camera Club.—(ESTABLISHED 1894.)—Meetings are held in the University Museum. *President*—Sir William J. Herschel, Bart., M.A. *Vice-Presidents*—Dr. M. Dugald Stark and E. A. Ryman-Hall. *Committee*—The Officers, and Miss Acland, C. Court Cole, E. C. H. Jessop, J. Minn, G. W. Norton, C. Rippon, M.A., G. Shelton. *Hon. Librarian*—James Squire. *Hon. Treasurer*—R. A. R. Bennett, M.A. *Hon Secretaries*—V. P. Sells, M.A., Highfield, New Headington, and H. A. Holliday, 17 Broad Street, Oxford.

Oxford University Photographic Society.—(ESTABLISHED 1882.)—Headquarters, 24 Friars Entry, Oxford. *President*—Hon. G. L. Parsons (Balliol). *Hon. Treasurer*—J. Walker (Christchurch). *Hon. Secretary*—A. M. Dillon (Lincoln).

Paisley Photographic Society.—(ESTABLISHED 1857, REORGANIZED 1885.)—Meetings held at 9 Gauze Street, Paisley. *Hon. Presidents*—H. H. Smiley and Stewart Clark. *Hon. Vice-Presidents*—Robert Harris, James Donald, jun, James Barr. *President*—Thomas H. Taylor. *Vice-President*—Morris M. Wright. *Council*—David B. Jack, Rev. John Crouch, Edward Cook, Charles Glassford, Alexander M. Kilpatrick, Matthew Morrison, A. F. M'Callum. *Treasurer*—Robert Pitblado. *Secretary*—Richard N. W. Thomson, 13 Abbey Street, Paisley.

Pennines Postal Photo Club.—(ESTABLISHED 1894.)—Portfolios circulate monthly. There is a Circulating Library, and a definite system of exchanges, also monthly note books and thorough mutual criticism. *Hon. Secretary*—A. Champness, Sedbergh, Yorks.

Peterborough Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Bedford Coffee House, Peterborough. *President*—George Kirkwood, M.D. *Vice-Presidents*—Dr. Walker, E. Worthington, G. W. Leigh. *Committee*—T. J. Calcutt, W. H. Pentney, J. F. Perkins, A. C. Taylor, J. T. Scotney. *Treasurer*—W. Atkinson. *Secretary*—A. W. Nicholls, 11 Cromwell Road, Peterborough.

Photographers' Benevolent Association.—(ESTABLISHED 1873.)—Meetings held at the Registered Offices, 6 Farringdon Avenue, E.C. *President*—George Mason. *Trustees*—Captain W. de W. Abney, C.B., R.E., F.R.S., &c., and W. S. Bird. *Committee*—R. Child Bayley, Robert Beckett, F. H. Berry, Charles Faulkener, T. E. Freshwater, G. T. Harris, H. R. Hume, P. G. Hunt, W. Fenton-Jones, A. Mackie, E. W. Parfitt, H. C. Rapson, J. S. Rolph, Frank H. Smith. *Hon. Solicitor*—George F. Fall. *Treasurer*—John Spiller, F.I.C., F.C.S. *Secretary*—H. Snowden Ward, 6 Farringdon Avenue, London, E.C.

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Photographic Convention of the United Kingdom.—(Established 1886.)—Meeting at Leeds in July, 1896, under the Presidency of H. P. Robinson. Retiring President (Shrewsbury), A. Haddon. The Photographic Convention was founded in 1886 for the advancement of photography, and to afford opportunities for personal intercourse and exchange of ideas amongst those interested in the art, from all parts of the United Kingdom. Meetings have been held at the following centres:—Shrewsbury, Dublin, Plymouth, Edinburgh, Bath, Chester, London, Birmingham, Glasgow, Derby. *Past Presidents*—Sir Howard Grubb, George Mason, William Bedford, George Davison, C. H. Bothamley, Andrew Pringle, J. Traill Taylor. *Council*—Sir Howard Grubb, W. Alltree, E. J. Appleby, Thomas Bedding, C. H. Bothamley, J. J. Briginshaw, F. A. Bridge, B. A. Burrell, W. Burson, F. P. Cembrano, Alexander Cowan, W. Crooke, J. L. Della Porta, Herbert Dennison, J. P. Gibson, Martin J. Harding, E. J. Humphery, H. M. Hastings, T. C. Hepworth, Paul Lange, C. Phipps Lucas, Percy Lund, J. L. Lyell, Major Lysaght, George Mason, Thomas Mayne, W. W. Naunton, J. H. Pickard, J. Porritt, Andrew Pringle, J. C. Ruthven, A. Seaman, H. M. Smith, John Stuart, H. Sturmey, J. Traill Taylor, W. Taylor, A. Tate, Washington Teesdale, Dr. J. C. Thresh, J. H. Walker, W. J. Warren, E. J. Wall, H. Snowden Ward, Leon Warnerke, G. Watmough Webster, A. Werner, S. B. Webber, J. B. B. Wellington, F. W. Williams, R. Hansford Worth. *Auditors*—John Howson and Thomas Fall. *Secretary and Treasurer*—R. Poulter Drage, 95 Blenheim Crescent, London, W.

Photographic Club.—(Established 1879.)—Meetings held at Anderton's Hotel, Fleet Street, E.C. *Trustees*—Frank Haes and A. Cowan. *Recorder and Curator*—G. W. Tottem. *Librarian*—E. A. Newell. *Secretary and Treasurer*—James A. Sinclair, 26 Charing Cross Road, W.C.

Photographic Salon.—(Established 1892.)—Meetings held at the Dudley Gallery, Egyptian Hall, Piccadilly. *Secretary*—Alfred Maskell, Dudley Gallery, Piccadilly, W.

Photographic Society of Ireland.—(Established 1854.)—Meetings held at 35 Dawson Street, Dublin. *President*—J. Alfred Scott, M.A., M.D., F.R.C.S.I. *Past Presidents*—Sir Howard Grubb, F.R.S., and George Mansfield, J.P. *Vice-Presidents*—Alfred Werner and Leonard R. Strangways, M.A. *Council*—E. McDowel Cosgrave, M.D., F.K.Q.C.P., A. M. Geddis, J. H. Hargrave, B.A., A.M.I.C.E.I., R. M. Inglis, J. M. Keogh, F. J. Richardson, James Simpson, V. E. Smyth, J. H. Woodworth, H. Goodwillie. *Hon. Treasurer*—William Bewley, B.A. *Hon. Secretary*—J. A. C. Ruthven, A.M.I.C.E.I., 40 Lower Sackville Street, Dublin. *Assistant Secretary*—W. F. Cooper, 194 Clonliffe Road, Drumcondra, Dublin.

Photographic Survey of Warwickshire.—(Established 1891.)—Meetings held at Exchange Buildings, Birmingham. *President*—Sir J. B. Stone. M.P. *Treasurer*—G. F. Lyndon, J.P. *Secretary*—J. H. Pickard, Southfield, Priory Road, Edgbaston, Birmingham.

Plympton Photographic Society.—(Established 1893.)—*President*—C. Aldridge, M.D. *Vice-President*—J. D. Pode, J.P. *Council*—President, Vice-President, Dr. Ellery, H. Tritton, Hon. Secretary. *Secretary and Treasurer*—T. H. Wilks, Plympton House, Plympton, South Devon.

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Plymouth Photographic Society.—(Established 1895.)—Meetings held at the Mechanics' Institute, Plymouth. *President*—Percy T. Pearce, C.C. *Vice-Presidents*—E. H. Micklewood and E. Croft. *Committee*—Messrs. Turney, Bowden, Pillar, Mayne, Hill. *Treasurer*—Thomas Stanning. *Hon. Secretary*—R. Rugg Monk, 4 Frankfort Street, Plymouth.

Postal Camera Club.—(Established 1894.)—A circulating Club for the criticism of prints by members, and mutual aid on matters photographic. The portfolios (of which there are two) circulate regularly, and each member receives one monthly. *Hon. Secretary*—Fitzgerald Griffith, Ennis, Co. Clare, Ireland.

Postal Photographic Club.—(Established 1886.)—Headquarters, Walton Manor Lodge, Oxford. Formed for the circulation and exchange of prints, and discussions on various matters of photographic interest. Criticisms are made on the prints circulating by the members. Prints are inserted by members as the cases reach them (about once a month). *Secretary*—R. A. R. Bennett, M.A., Oxon.

Postal Photographic Competition Club.—(Established 1893.)—Monthly circulation of pictures. *Secretary and Treasurer*—Hugo Meynell, Farley, Cheadle, Stoke-on-Trent.

Preston Camera Club.—(Established 1891.)—Rooms, Arcade Chambers, Fishergate, Preston. *President*—Colonel Oliver, J.P. *Vice-Presidents*—M. B. Copland, J.P., Richard Wilding, F.R.A.S., T. Whitehead, H. B. Smith. *Committee*—James Atherton, J. Newsome, James Mackintosh. W. J. T. Jackson. *Hon. Secretary and Treasurer*—Frank Ketton, Oak Cottage, Fulwood, Preston.

Pudsey and District Photographic Society.—(Established 1891.)—*President*—Dr. Hunter. *Secretary and Treasurer*—J Goodman, 5 Belle Vue Terrace, Brunswick Road, Pudsey.

Putney Photographic Society.—(Established 1890.)—Meetings held at the School of Art, on the first and third Thursdays during the months from October to end of April. *President*—The Hon. Baron Pollock. *Vice-Presidents*—John A. Hodges, H. Kimber, M.P., Dr. W. J. Sheppard. *Council*—F. Chasemore, Dr. J. F. Farrar, H. Faulkner, T. Gilbert, W. F. Gorin, William Martin, jun., W. Plank, Dr. C. Wyman, L. S. Zachariasen. *Secretary and Treasurer*—William Martin, jun., 4 Lower Parkfields, Putney, S.W.

Ramsgate Camera Club.—(Established 1894.)—Meetings are held at the Victoria Hotel, Hardres Street, Ramsgate. *President*—George R. Tweedie, J.P., F.C.S. *Vice-Presidents*—W. T. Davey and E. E. Wassall, J.P. *Committee*—J. Adams, F. B. Bear, T. J. Dutton, G. L. Falcy, G. Hoile, A. W. Kingsland, W. V. Lambert, T. B. Smith, J. W. Vickery, A. Vigar. *Treasurer*—Robert J. Smith. *Secretary*—Henry G. Holloway, jun., Faversham Villa, Southwood Road, Ramsgate.

Redruth Photographic Club.—(Established 1892.)—Meetings held at the Studio, West End, Redruth. *President*—T. C. Peter. *Vice-Presidents*—E. Lanyon and T. Jones. *Committee*—E. Williams, W. M. Martin, James Thomas, T. Pengelly. *Secretary*—J. E. Harvey, Cross Street, Redruth.

Who makes your Bromide Paper?

Reading Y.M.C.A. Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Y.M.C.A., Valpy Street, Reading. *Sub-Committee* (under control of Y.M.C.A. Committee)—C. W. Sisley, F. H. Lewis, H. A. Churchill. *Secretary and Treasurer*—Henry A. Churchill, Bath Villa, Upper Redlands Road, Reading.

Richmond Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Greyhound Hotel, Richmond, Surrey. *President*—F. P. Cembrano, jun. *Vice-Presidents*—P. Ennis and E. D. Purcell. *Committee*—J. H. Alabaster (Lanternist), G. Ardaseer (Librarian), P. B. Broomhall, J. D. Gibson, C. W. Harris, M. D. King. *Treasurer*—J. B. Huddy. *Secretary*—C. H. Davis, 97 Church Road, Richmond, Surrey.

Rochester Naturalists' Club (Photographic Section).—(ESTABLISHED 1892.)—Meetings held at the Mathematical School, Rochester. *President*—C. Bird, B.A., F.G.S. *Vice-President*—J. H. Whitfield. *Council*—J. C. Boon, J. Hepworth, J. S. Hewitt, P. J. Neate, T. F. Fannahill, M.B., C.M., D.P.H., E. S. Wilson. *Treasurer*—R. Lines. *Secretary*—John L. Allen, Clover House, Chatham.

Rock Ferry Camera Club.—(ESTABLISHED 1894.)—Meetings are held at St. Peter's Hall, New Chester Road. *President*—Samuel Cross. *Vice-President*—Dr. E. R. W. Spratley. *Committee*—Miss E. Cross, Mrs. Journeay, Rev. W. T. Warburton, M.A., F. Elsley, R. W. Hill, C. R. Jones. *Treasurer*—R. G. Armstrong. *Secretary*—R. Martin Smith, jun., 'Carlton,' Cavendish Park, Rock Ferry.

Rodley Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at members' houses. *Secretary and Treasurer*—H. Crossley, Rodley, near Leeds.

Romford and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at High Street, Romford. *President*—W. E. Gibb, J.P. *Vice-President*—A. Money Wigram, M.P. *Committee*—R. T. Aldous, C. Burchall, T. Doy, C. Hussey, A. G. Lucas, A. E. March, E. A. Michell, O. L. Puckle, W. J. Slaughter. *Treasurer*—J. W. Latham. *Secretary*—A. John Ormiston, Laurie Square, Romford.

Rossendale Camera Club.—(RE-ESTABLISHED 1894.—Meetings held at the Blue Ribbon Club. *President*—W. Entwistle. *Vice-President*—John Taylor. *Committee*—T. Oddie, L. Poynton, S. Simpson, J. Shadlock, J. Butterworth. *Treasurer*—A. F. Stanesley. *Secretaries*—Edward J. Mould, 70 Bank Street, Rawthenstall, and W. H. Booth, Minor Street, for Crawshawbooth.

Rotherham Photographic Society.—(ESTABLISHED 1889.)—Meetings held at 5 Frederick Street, Rotherham. *President*—F. B. J. Baldwin, M.R.C.S. *Vice-Presidents*—E. Isle Hubbard, M.S.A., James Leadbeater, G. T. M. Rackstraw. *Council*—J. W. Baker, W. Mason, W. H. Shephard, W. H. Haywood, John Clarke, together with the Officers. *Treasurer*—A. S. Lyth. *Secretary*—H. C. Hemmingway, 6 Stanley Street, Rotherham *Assistant Secretary*—J. W. Baker.

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Royal Cornwall Polytechnic Society.—(Established 1833.)—Meetings held at Falmouth. *Patroness*—Her Most Gracious Majesty the Queen. *Vice-Patron*—His Royal Highness the Prince of Wales, K.G. *President*—T. Bedford Bolitho, M.P. *Vice-Presidents*—Professor W. Grylls Adams, F.R.S., W. Naylor Carne, F. W. Dymond, T. W. Field, Right Hon. Viscount Falmouth, E. W. Bailey, F.E.S., F.L.S., J. D. Enys, F.G.S., J. Passmore Edwards, Professor T. E. Thorpe, F.R.S., J. Bevill Fortescue, William Brooks, John Stephens. *Curator*—R. N. Worth, F.G.S. *Treasurer*—Robert Milford Tweedy. *Secretary*—Edward Kitto, F.R.Met.S., The Observatory, Falmouth.

Royal Photographic Society.—(Established 1853.)—Meetings are held at 12 Hanover Square, London, W. *President*—Sir H. Trueman Wood, M.A. *Vice-Presidents*—Captain W. de W. Abney, C.B., R.E., D.C.L., F.R.S., T. R. Dallmeyer, F.R.A.S., A. Pringle, F.R.M.S., J. Spiller, F.I.C., F.C.S. *Council*—T. Bedding, F. A. Bridge, J. Cadett, F. P. Cembrano, jun., A. Cowan, T. Sebastian Davis, F.C.S., W. E. Debenham, W. England, Colonel J. Gale, T. C. Hepworth, F.C.S., F. Hollyer, H. A. Lawrance, F.I.C., F.C.S., Major J. D. Lysaght, A. Mackie, J. W. Marchant, J. W. Swan, M.A., F.R.S., J. Traill Taylor, E. J. Wall, Leon Warnerke, Horace Wilmer. *Hon. Librarian*—Edgar Clifton. *Hon. Solicitor*—Francis Ince. *Hon. Treasurer*—G. Scamell. *Hon. Secretary*—Chapman Jones, F.I.C., F.C.S., 11 Eaton Rise, Ealing, W. *Assistant Secretary*—R. Child Bayley, 12 Hanover Square, W.

Scarborough and District Photographic Society.—(Established 1892.)—Meetings held at the Museum, Scarborough. *President*—Rev. W. Tofield Reeder, M.A. *Committee*—Miss A. Woodall, Miss M. McCallum, E. Holmes, J. Whitfield, J. B. Spicer, J. G. Megginson. *Secretary and Treasurer*—James H. Rowntree, Westwood, Scarborough.

Shaw Church Institute Photographic and Art Society.—(Established 1888.)—Meetings held at the Shaw Church Institute. *President*—James Broadbelt. *Vice-President*—Henry Buckley. *Committee*—John Watson, J. R. Royds, T. Mitchell. *Secretary and Treasurer*—John Maiden, 91 Rochdale Road, Shaw, near Oldham.

Sheffield Optical Lantern Society.—(Established 1890.)—Meetings held at St. Paul's Schools, Cambridge Street, Sheffield. *President*—Dr. Manton. *Vice-Presidents*—J. Clowes, Rev. F. W. Stubbs, J. H. Lygo. *Committee*—T. G. Allen, T. Baker, E. G. Draper, R. Glenn, H. Staniforth, J. Stacey, C. Thornhill, J. Temperton, J. W. Wilshaw. *Reporter*—J. S. Stephens. *Treasurer*—E. Copley. *Secretary*—James Maclaurin, Sidney Street, Sheffield.

Who makes your Bromide Enlargements?

Sheffield Photographic Society.—(Established 1876.)—Meetings are held at the Masonic Hall, Surrey Street. *President*—Bradley Nowill. *Vice-Presidents*—Ernest Beck, George Tomlinson, David C. Brooks. *Council*—Sparham Camp, Thomas Firth, W. T. Furniss, E. A. Pearce, T. G. Hibbert. *Treasurer*—Joseph Smith. *Secretary*—Herbert Ellis, 63 Meersbrook Park Road, Sheffield.

Shropshire Camera Club.—(Established 1886.)—Meetings held at Castle Chambers, Castle Street, Shrewsbury. *President*—Joseph Lewis Della Porta. *Vice-Presidents*—Martin J. Harding, Walter W. Naunton, Frederick W. Williams. *Council*—F. R. Armytage, M.A., W. Alltree, W. Bowdler, C. W. Ebrall, W. Heath, W. G. Preece. *Hon. Treasurer*—A. G. Lawson. *Hon. Secretary*—Frederick W. Williams.

Society for the Encouragement of Arts, Manufactures, and Commerce.—(Founded in 1754. Incorporated by Royal Charter in 1847.)—Meetings are held in John Street, Adelphi, London. *Council*—H.R.H. the Prince of Wales, K.G. (President of the Society), Major-General Sir John Donnelly, K.C.B. (Vice-President and Chairman of the Council), H.R.H. the Duke of Saxe Coburg Gotha, K.G. (Vice-President), H.R.H. the Duke of York, K.G. (Vice-President), Duke of Abercorn, K.G., C.B. (Vice-President), Captain W. de W. Abney, C.B., F.R.S., William Anderson, C.B., D.C.L., F.R.S. (Vice-President), The Attorney-General, G.C.M.G., Q.C., M.P. (Vice-President), Sir Steuart Colvin Bayley, K.C.S.I., C.I.E., John Wolfe Barry, C.B., F.R.S., Lord Belhaven and Stenton, Sir Edward Birkbeck, Bart. (Vice-President), Sir Courtenay Boyle, K.C.B. (Vice-President), Sir Frederick Bramwell, Bart., D.C.L., F.R.S. (Treasurer), George Ledgard Bristow, Major-General Sir Owen Tudor Burne, K.C.S.I., C.I.E. Michael Carteighe (Vice-President), R. Brudenell Carter, F.R.C.S., The Lord Chancellor (Vice-President), Sir George Hayter Chubb, B. Francis Cobb (Vice-President), Francis Elgar, LL.D., Professor Clement Le Neve Foster, D.Sc., F.R.S., Hon. Sir Charles W. Fremantle, K.C.B. (Vice-President), Sir Douglas Galton, K.C.B., D.C.L., F.R.S. (Vice-President), Lord Kelvin, P.R.S. (Vice-President), Sir Charles Malcolm Kennedy, K.C.M.G., C.B. (Vice-President), Sir Stuart Knill, Bart., Alderman (Vice-President), Sir Frederick Leighton, Bart., P.R.A. (Vice-President), Sir Villiers Lister K.C.M.G. (Vice-President), Sir Westby B. Perceval, K.C.M.G., William Henry Preece, C.B., F.R.S. (Vice-President), Sir Owen Roberts, M.A. D.C.L., F.S.A. (Treasurer), Professor William Chandler Roberts-Austen, C.B., F.R.S. (Vice-President), Sir Albert Kaye Rollit, LL.D., M.P. (Vice-President), Earl of Rosebery, K.G., K.T. (Vice-President), Sir Saul Samuel, K.C.M.G., C.B. (Vice-President), Alexander Siemens. *Auditors*—J. O. Chadwick and Son. *Accountant*—Howard H. Room. *Secretary*—Sir Henry Trueman Wood, M.A. *Assistant Secretary*—Henry B. Wheatley, F.S.A.

Southport Social Photographic Club.—(Established 1890.)—Meetings held at The Studio, 15 Cambridge Arcade. *President*—D. E. Benson. *Vice-Presidents*—W. P. Brown and H. J. Heaton. *Committee*—Miss Unsworth, C. F. Depree, J. S, Dickin, J. C. Smith, Dr. Tordoff. *Treasurer*—J. R. Cave. *Secretary*—George Cross, 15 Cambridge Arcade, Southport.

Morgan & Kidd
Richmond

Snap-shot Postal Club.—(Established 1895.)—*Secretary and Treasurer*—O. H. Bayldon, 33 Steeles Road, Haverstock Hill.

South London Photographic Society.—(Established 1888.)—Meetings held at Hanover Hall, Hanover Park, Peckham, S.E. *President*—F. W. Edwards. *Vice-Presidents*—S. W. Gardner, Maurice Howell, Dr. T. G. Munyard, W. Rice. *Committee*—W. C. Boyce, F. F. Buckle, C. F. Dickinson, A. Fellows, F. W. Grigg, B. Lyon, J. Miller, W. F. Slater, E. A. Whitby. *Curator*—G. H. Moss. *Hon. Lanternist*—J. T. French. *Delegates to the Affiliation of Photographic Societies*—F. W. Edwards and Charles H. Oakden. *Hon. Treasurer*—M. Boxall. *Hon. Secretary*—Charles H. Oakden, 30 Henslowe Road, East Dulwich, S.E. *Hon. Assistant and Excursion Secretary*—A. E. Allen, 27 Princes Square, Kennington, S.E.

Southsea Amateur Photographic Society.—(Established 1888.)—Affiliated with the Royal Photographic Society. Meetings held at 5 Pembroke Road, Portsmouth. *President*—Major Wilkinson, R.E., F.R.P.S. *Vice-President*—Major H. W. B. Bruno. *Committee*—A. Fisher, F.S.A., F. W. Fox, M.A., T. W. Seccombe, R.N., G. Whitefield. *Treasurer*—Dr. F. Lord. *Secretary*—H. T. Lilley, M.A., 22 Pelham Road, Southsea.

Spalding and District Photographic Society.—Established 1894.)—Meetings held at Spalding. *President*—W. A. Southwell. *Vice-Presidents*—Rev. R. G. Ash and G. F. Barrell. *Committee*—T. Bloodworth, A. K. Maples, H. B. Massey. *Secretary and Treasurer*—E. Wightman Bell, High Bridge, Spalding.

Staffordshire Photographic Survey Society.—(Established 1891.)—Place of Meeting, Free Library, Stoke-upon-Trent. *President*—Bishop of Lichfield. *Vice-Presidents*—Bishop of Shrewsbury, Earl of Dartmouth, Alexander Scrivener. *Committee*—E. H. Barker, E. J. Daniels, George Lynam, W. A. Meigh, F. Mountford, E. W. Wain, H. E. Whytehead. *Treasurer and Secretary*—A. J. Caddie, Free Library, Stoke-upon-Trent.

Staffordshire Potteries Photographic Society.—(Established 1889.)—Meetings held at the Wedgwood Institute Science and Technical Schools, Burslem. *President*—Arthur Shorter. *Vice-Presidents*—E. B. Wain, M.I.C.E., Bernard Howson, A. E. Hils. *Council*—J. F. Hewitt, F. C. Powell, G. S. Turner, W. J. Slater, H. R. Makepeace, A. Delves. *Treasurer*—S. Gibson. *Secretary*—W. H. Walley, Queen Street, Burslem.

St. Bartholomew's Hospital Photographic Society.—(Established 1890.)—Meetings held at St. Bartholomew's Hospital. *President*—Dr. W. J. Russell, F.R.S. *Vice-Presidents*—Dr. H. Lewis Jones and F. Womack, M.B. *Committee*—G. A. C. Calvert, S. E. Gill, W. B. Jones, M.B. *Secretaries*—J. Hussey and M. G. Pearson, B.Sc., St. Bartholomew's Hospital, London, E.C.

Stereoscopic Postal Exchange Club.—(Established 1893.)—For the furtherance of stereoscopic work and exchange of slides. There are two monthly boxes in circulation, which are drawn for at the end of the year. *President*—W. W. Stainthorpe, M.D., J.P. *Secretary and Treasurer*—B. Diveri, B.A., Huntly, N.B.

Who makes your
Carbons & Platinotypes?

St. John's Photographic and Scientific Society.—(Established 1892.)—Meetings held in the Parish Room. *President*—Rev. H. Bethell-Jones, M.A. *Vice-President*—F. J. Simpson. *Committee*—E. B. Beesley, R. J. McGown, J. Wilcock. *Treasurer*—S. G. Thompstone. *Secretary*—C. Bethell-Jones, Brooklands Vicarage, Manchester.

Helens and District Photographic Society.—(Established 1894.)—Meetings held at Wolverhampton House, Church Street, St. Helens. *President*—Rev. J. W. Willink. *Vice-Presidents*—R. G. Brook, Colonel Gamble, C.B., C. H. Jolliffe, D. McKechnil, J.P., F. R. Dixon-Nuttall, J.P., W. Thomason. *Council*—A. M. Booth, J. Cammack, J. Critchley, W. W. Gandy, D. Thomason, L. West, J. Westworth. *Secretary and Treasurer*—J. C. Nicol, 28 Hamer Street, St. Helens, Lancashire.

Stockport Photographic Society.—(Established 1889.)—Meetings held at the Mechanics' Institute. *President*—Colonel Turner, J.P. *Vice-Presidents*—Thomas Kay, J.P., E. F. Ward, W. B. Leigh. *Council*—T. Bedford, George Hidderley, A. M. Gourley, H. L. Overton, B. S. Harlow, O. Coppock, W. A. Downham, J. W. Buckley, J. Lingard, E. Johnson. *Treasurer*—W. T. Scott. *Secretary*—Thomas Gould, 104 Chestergate, Stockport.

Stockton Photographic Society.—(Established 1887.)—Meetings held at Mason's Court, High Street. *President*—W. Downs. *Vice-President*—H. Bradley. *Council*—F. Appleby, J. H. Draper, W. S. Fothergill, W. K. Hunton, J. H. Jackson, Dr. Stainthorpe. *Treasurer*—J. H. Rhodes. *Secretary*—J. E. Ellam, Yarm.

St. Peter's Park Amateur Photographic Society.—(Established 1894.)—Meetings held at the St. Peter's Institute, Chippenham Road, Paddington. *President*—Rev. James White. *Committee*—Messrs. Evans, Marsh, and Mann. *Treasurer*—E. R. Marsh. *Secretary*—F. Mann, 48 Elgin Avenue, Paddington.

Stroud Photographic Society.—(Established 1895.)—Meetings are held on alternate Friday evenings in the Stroud School of Art. *President*—W. J. Paley Marling, M.A. *Committee*—W. H. C. Fisher, T. Lay Fairweather, F. Avens, T. Turnell, W. Ridler. *Hon. Secretary*—T. Hackwood, Newland Villas, Stroud, Gloucestershire.

Sun & Company.—(Established 1886.)—A Postal Photographic Society, limited to forty amateurs, for the monthly circulation and criticism of photographs, entirely the work of members, and for a general interchange of ideas, with a view to mutual advancement in the science and art of photography. *Committee*—F. de Paula, Wallace Heath, F. W. Williams, and the Hon. Secretary. Application for vacancies should be made to the Hon. Secretary, Martin J. Harding, 6 Havelock Road, Shrewsbury.

Sunderland Photographic Association.—(Established 1888.)—*President*—W. Milburn. *Vice-Presidents*—J. Lynn and Wm. Pratt. *Council*—Geo. Bartram, A. C. Boulton, W. Broderick, W. Horan, E. R. Kirkley, A. Peddie, W. J. Pearson, W. Pope. *Hon. Treasurer*—T. Walton. *Secretaries*—W. N. Bartram and C. E. Cowper, 69 John Street, Sunderland.

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Sunbeam Portfolio Club.—(Established 1892.)—*Committee*—James Simkins and W. H. Whittard. *Secretary*—W. J. Farthing, Chirk, North Wales.

Sutton Coldfield Camera Club.—(Established 1889.)—Meetings held at the Town Hall, Sutton Coldfield, Warwickshire. *President*—H. Duncalfe, M.R.C.S., J.P. *Vice-Presidents*—S. A. Taylor, G. H. Dugard, M. H. Highway. *Committee*—H. Billson, C. J. Fowler, T. S. Hooper, G. L. Price, T. H. Purden. *Treasurer*—G. Parker. *Secretary*—Henry Rabnett, Hartopp Cottage, Four Oaks, Sutton Coldfield.

Sutton Scientific and Literary Society (Photographic Section).—(Established 1886.)—Meetings held at the Public Hall Chambers, Sutton, Surrey, on the first Tuesday in each month. *Chairman*—E. de Clifford. *Committee*—F. S. Cripps, W. Goode, Mrs. Culverhouse. *Recorder*—A. P. Hoole, The Willows, Sutton, Surrey.

Talbot Album Club.—(Established 1886.)—Established for the monthly circulation and criticism of members' work. One album is sent out on the first of every month, and at the end of the year the albums are divided among the members. *Secretary*—Frederick H. Davies, 265 Coventry Road, Birmingham.

Todmorden Photographic Society.—(Established 1892.)—Meetings held at the Society's Rooms, Burnley Road. *President*—William Ormorod. *Vice-Presidents*—William Lord, Rev. E. J. Russell, J. Holt. *Council*—W. E. Shackleton and W. Fairbourn. *Treasurer*—Rev. E. Parry. *Secretary*—William Snowden, 14 Stansfield Street, Todmorden.

Toxteth Amateur Photographic Society.—(Established 1894.)—Meetings held at the Church Room, Belgrave Road, St. Michaels, Liverpool. *President*—E. H. Maddocks. *Chairman*—W. Driver. *Council*—R. C. Crowe, J. Smith, J. M. Jones, H. Walton, J. H. Killip, E. Downey, W. Jones, W. J. Sutherland, J. A. Huntington. *Treasurer*—F. B. Blundell. *Secretary*—Henry Goldstone, 53 Alwyn Street, St. Michaels, Liverpool.

Trowbridge and District Photographic Society.—(Established 1893.)—Meetings held at Mr. Wilkins's, The Parade, Trowbridge. *Committee*—Rev. W. H. Start, G. Lansdown, J. H. Aplin, T. A. Dring, A. J. Cogswell, A. F. Wilkins. *Secretary and Treasurer*—R. H. Foley, The Halve, Trowbridge, Wiltshire.

Tunbridge Wells Amateur Photographic Association.—(Established 1887.) Meetings held at the Mechanics' Institute, on the first Thursday in the month. *Patron*—Sir David Salomons, Bart. *President*—F. G. Smart, M.A. *Vice-Presidents*—Rev. A. T. Scott, M.A., E. R. Ashton, George Lewis. *Committee*—J. W. Morgan, A. W. Pierson, G. W. Howard, F.C.S. *Hon. Auditor*—Edward Catchpole. *Hon. Treasurer*—B. Whitrow. *Hon. Secretary*—Joseph Chamberlain, 14 Calverley Park Gardens.

Uttoxeter Photographic Society.—(Established 1891.)—Meetings held at Carter Street, Uttoxeter. *President*—Rev. C. F. Lowry Barnwell. *Vice-Presidents*—Hugo Meynell and F. A. Bolton. *Committee*—Messrs. Hardy, Holmes, Udale, Walker, McCann, Wallis, and A. Parker. *Treasurer*—R. T. A. Hardy. *Secretary*—Alfred Parker, High Street, Uttoxeter.

Who makes your Dry Plates?

Ulster Amateur Photographic Society.—(ESTABLISHED 1886.)—Meetings held at the Museum, College Square North, Belfast. *President*—William Gray, M.R.I.A., &c. *Vice-Presidents*—John Brown and Cecil E. Shaw, M.A., M.D. *Committee*—F. J. Brill, J. Campbell Carson, W. Redfern Kelly, F.R.A.S., James Leslie, Walter Maxwell, James M'Cleery, William Swanston, F.C.S., D. Simms, M.Inst.C.E., James Stelfox. *Treasurer*—Robert E. Workman. *Hon. Secretaries*—E. A. Brill and W. J. M'Murray, Belfast Bank, Belfast.

Vale of Llangollen Camera Club.—(ESTABLISHED 1893.)—Meetings held at Salop House. *President*—Ralph Darlington, F.R.G.S. *Vice-Presidents*—J. M. Corney and Joseph Hall. *Committee*—Hiram Davies, Sergeant Bagshaw, John H. Davies, Jonathan Edwards. *Treasurer*—Gomer Rowlands. *Secretary*—Herbert Victor Davies, Salop House, Llangollen.

Wakefield Photographic Society.—(ESTABLISHED 1891.)—Meetings held at the Studio, Snow Hill View, Wakefield. *President*—Rev. Aspinall Addison. *Vice-Presidents*—Dr. Clarke and H. Crutchley. *Committee*—A. W. Stanfield, P. Cradock, R. Robson, J. R. Shaw, W. Wrigley, W. Norwood. *Treasurer*—H. R. Haigh. *Secretary*—A. H. Roberts, Stoneleigh Lodge, Wakefield.

Walsall Amateur Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Y.M.C.A., Walsall. *President*—J. R. Cooper. *Vice-Presidents*—Frederick Brown, Sydney Gedge, M.P., A. C. Greatrex, H. N. Grove, T. J. Hansor, J. Hildick, Frank James, J.P., George Lavender, J. A. Leckie, C. A. Loxton, W. Oliver, G. G. Potter, H. Smith, F. C. Smith, A. Thacker, W. Thacker, George Warner, F. W. Willmore, J. S. Wilson, C. J. Windle, F. J. Zeller. *Committee*—W. H. Bullock, J. W. Carver, C. G. Crooke, B. Greatrex, W. A. Hubball, W. Meikle, S. A. Newman, Thomas Partridge, H. B. Smith. *Secretary and Treasurer*—E. A. Day, 40 Lysways Street, Walsall.

Walthamstow Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Grosvenor House, Hoe Street, Walthamstow. *President*—W. Houghton. *Committee*—J. E. Galliford, A. G. Gibbard, W. E. Lane, J. Payne, H. Saunders, T. Willats. *Treasurer*—W. A. Longmore. *Secretary*—Claud S. Scott, 'Brabourne,' The Drive, Walthamstow.

Walton Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Walton Church Schools. *President*—F. Murphy. *Council*—John Parke, George Latimer, H. T. Livesley, W. W. Maver, Henry Sharrock, John Kennedy. *Secretary and Treasurer*—T. Bickerstaff, 121 Makin Street, Walton, Liverpool.

Walworth Junior Postal Camera Club.—(ESTABLISHED 1895.)—Circulates prints for criticism and exchange among the members once a month. Discussions on photographic matters are carried on in a note-book which accompanies the prints, in which also queries and answers are written and exchanges arranged. *Hon. Secretary and Treasurer*—Percy C. Cornford, 36 Inville Road, Walworth, S.E.

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Richmond

Warrington Amateur Photographic Society.—(Established 1886.)—Meetings are held in the Committee Room of the Museum, Bold Street, on the last Tuesday in each month, at Eight p.m. The Council propose to hold two meetings in the months of October, November, December, January, February, and March. *President*—T. J. Down. *Vice-Presidents*—H. N. Houghton and Thomas Hesketh. *Committee*—J. Harding (Eustace Street), J. Harding (Liverpool Road), J. Hallows, G. Kirby, Thomas Welsby, C. Aylward, F. Pearson, J. W. Cavanagh. *Librarian*—John Skelton. *Auditor*—J. Fairhurst. *Treasurer*—P. Dalton. *Secretary*—Harry Pritchard, 162 Orford Lane, Warrington.

Waterloo Social Camera Club.—(Established 1893.)—Meetings held at Waterloo. *President*—E. Rawlins. *Committee*—E. Rawlins, J. C. Matthews, W. O. Muir, A. N. Jack, A. L. Griffith, G. D. Dean, J. B. Bannister, C. W. Budden. *Treasurer*—J. C. Matthews. *Secretary*—C. W. Budden, 7 Cambridge Road, Waterloo, Liverpool.

West Kent Amateur Photographic Society.—(Established 1888.)—Meetings are held at the Station Hotel, Bexley, Kent. *President*—Andrew Pringle. *Vice-Presidents*—A. R. Dresser and V. Taylor. *Council*—Messrs. Clare, Crowe, Nash, Bros, Clarke, Badderley, and Gill. *Secretary*—Edward Hawkins, Manor Estate, Sidcup, Kent.

West London Photographic Society.—(Established 1888.)—Meetings are held at the School of Arts and Crafts, Bedford Park. *President*—G. F. Blackmore. *Vice-Presidents*—W. A. Brown, Leslie Selby, J. Wilson, C. Winter. *Council*—J. J. Adam, C. Dixon, A. Ebb, R. Horton, J. E. Kellow, G. Lamley, H. Réné Rainger, H. Selby, G. E. Varden, R. W. Watson. *Treasurer*—W. H. Whitear. *Secretaries*—James Stein, 28 Martin's Lane, Cannon Street, E.C., and F. W. Adams, 16 Queen Anne's Grove, Bedford Park, W.

West Surrey Photographic Society.—(Established 1887.)—Meetings held at the Felix Institute, Lavender Hill, S.W., every Wednesday evening. *Patron*—P. M. Thornton, M.P. *President*—Colonel J. Gale. *Vice-Presidents*—Messrs. Lyell, Seward, F. H. Smith, and Winsford. *Committee*—Messrs. Bulbeck, Eastmead, P. Martin, Thompson, Agars, Hoad, Pointon, and Price. *Secretary and Treasurer*—Charles E. White, 17 Garfield Road, Lavender Hill, S.W. *Assistant Secretarg*—J. S. Bond.

Weymouth and District Camera Club.—(Established 1895.)—Meetings held at Milledge's Rooms, 74 St. Thomas's Street, Weymouth. *President*—B. Browning, F.C.S. *Vice-Presidents*—Charles T. Hope, M.R.A.C., F.C.S., Colonel R. H. Palmer, Rev. J. Sealey-Poole. *Council*—Rev. J. H. Moriarty, H. H. Du Boulay, W. G. Cox, C. J. Gibbs, E. W. Flisher. *Treasurer*—E. H. Wiseman. *Secretary*—W. H. W. Batt, Wadham House, Weymouth.

Widnes Photographic Society.—(Established 1893.)—Meetings are held at Bedford Chambers, Albert Road, Widnes. *President*—V. C. Driffield. *Vice-President*—J. Newburn. *Council*—J. S. Sinclair, W. Priestnall, O. H. White, G. J. Warner, J. Atherton. *Treasurer*—T. Cosier. *Secretary*—A. J. Squires, 32 Derby Road, Farnworth-in-Widnes.

Who makes your
Collotype Prints?

Wigan Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Quadrant Café, Rodney Street, Wigan. *President*—R. Wardman. *Vice-Presidents*—Rev. J. S. Barnes, G. R. Newman, S. Richardson. *Council*—J. H. Atherton, B. B. Hartley, John Smith, H. S. Hill, C. R. S. Kirkpatrick, W. E. Boyce, G. M. Martin. *Secretary and Treasurer*—Frederick Betley, 10 Ashland Avenue, Wigan.

Wolverhampton Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Blind Institute, Victoria Street, Wolverhampton. *President*—J. Gale. *Vice-President*—H. E. Perry. *Committtee*—Rev. — Beveridge, Messrs. H. Holcroft, M.A., Taylor, Cox, Hall, Stokes, Bott, and F. White. *Lanternist*—W. G. Orme. *Treasurer*—F. J. Gibson. *Secretary*—S. R. Rhodes, 53 Queen Street, and Merrivale Road, Wolverhampton.

Woodford Photographic Society.—*President*—H. T. Malby. *Council*—E. B. Caird, E. Marriage, W. Smith. *Lanternist*—E. Noble. *Secretary and Treasurer*—F. E. Emler, 1 Florence Villas, Chelmsford Road, Woodford.

Woolwich Photographic Society.—(ESTABLISHED 1892.)—Affiliated with the Royal Photographic Society. Meetings held at the St. John's Schools, Woolwich, on the second and fourth Thursday in the month, from October to April inclusive. *President*—Colonel C. D. Davies. *Vice-Presidents*—Rev. S. E. Chettoe, W. H. Dawson, H. H. Barker, *Council*—J. Calder, W. G. Champion, J. Cregan, J. Desforges, W. R. Dunger, F. T. Hards. *Librarian*—H. J. Maskell. *Secretary and Treasurer*—J. Borthwick Panting, 3 Friars Villas, Old Charlton. *Assistant Secretary*—Fred. W. Machen, 161 Griffin Road, Plumstead, S.E.

Woolwich Polytechnic Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Polytechnic, William Street, Woolwich. *President*—A. R. Dresser. *Vice-Presidents*—Right Hon. Viscount Maitland, Andrew Pringle, G. H. Banister. *Committee*—Messrs. Kemp, Taylor, Ellis, and Forsdyke. *Secretary and Treasurer*—W. Dawes, 145 Chesnut Road, Plumstead.

Worcester Tricycle Club (Camera Section).—(ESTABLISHED 1892.)—Meetings held at the Bell Hotel, Worcester. *President*—J. Wilkes. *Committee*—J. Boughton, J. J. Cam, W. H. Cam, S. Hill, F. E. Hill, T. James, J. Judson, T. Thomasson. *Treasurer*—F. E. Hill. *Secretary*—Thomas J. Hobson, 15 Albany Terrace, Britannia Square, Worcester.

Wycombe Camera Club.—(ESTABLISHED 1892.)—Meetings held at the South Bucks Auction Mart, Wycombe. *President*—L. Broughton. *Vice-Presidents*—The Mayor of Wycombe, Viscountess Curzon, Earl Buckinghamshire, J. Parker, C. Disraeli, M P. *Committee*—B. Baker, H. H. Thornbery, H. Strange, H. Norton, J. A. Howell. *Secretary and Treasurer*—J. Wilford, 7 High Street, High Wycombe.

Y.M.C.A. Camera Club.—(ESTABLISHED 1889.)—Meetings are held at the Central Y.M.C.A., 56 Mount Pleasant. *President*—W. P. Christian. *Vice-Presidents*—T. Jameson, J. F. Shone, John C. Lee. *Secretary and Treasurer*—Edward Sanders, 144A Brownlow Hill, Liverpool.

Morgan & Kidd
Richmond

Y.M.C.A. Camera Club.—Meetings held at Christian Union Buildings, Lower Abbey Street, Dublin. *President*—E. MacDowel Cosgrave, M.D. *Vice-Presidents*—L. Davidson, G. W. Rikey, A. E. Campbell. *Committee*—Messrs. Parnell, Stewart, Thompson, Campbell, Barnes, Summers, Barber, and Shiels. *Secretaries*—J. P. Lewis and E. C. Matson, 34 Capel Street.

Yorkshire Philosophical Society (Photographic Section).—(ESTABLISHED 1888.)—Meetings are held at the Museum, York. *President*—Tempest Anderson, M.D., B.Sc. *Vice-Presidents*—W. Monkhouse and J. N. Kitching. *Committee*—E. F. Lewin, George Baker, Hinton Bateman, A. Tempest. *Secretary and Treasurer*—H. Dennis Taylor, F.R.A.S., Trenfield, Holgate, York.

York Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the Victoria Hall, Goodramgate, York. *President*—Watson Hirst. *Vice-President*—Thomas Brown. *Council*—A. C. Hick, R. Redpath, F. Vincent, J. Saville, W. Weatherill. *Treasurer*—R. Bainbridge. *Secretary*—G. P. Benson, 50 Scott Street, York.

COLONIAL PHOTOGRAPHIC SOCIETIES.

Amateur Photographic Association of Victoria, Melbourne.—(ESTABLISHED 1883.)—Meetings held at the Royal Society's Hall, Victoria Street, Melbourne. *Secretary*—J. H. Harvey, Public Works Department, Melbourne.

Amateur Photographic Society of Madras.—(ESTABLISHED 1888.)—Meetings held at the Masonic Hall, Mount Road, Madras. *Patrons*—H.E. the Rt. Hon. Lord Wenlock, G.C.I.E., Governor of Madras, and the Hon. Maharajah of Vizianagram, G.C.I.E. *President*—E. W. Stoney, M.I.C.E. *Vice-Presidents*—C. E. Phipps and J. H. Cook. *Committee*—A.E. Lawson, T. P. S. Nagaratnam Pillai, A. L. H. Palmer, W. H. Oakes, E. Thurston, J. L. Walker. *Treasurer*—V. G. Lynn. *Secretary*—Surgeon-Major J. L. Van Geyzel, M.B., F.I.C., Chetput, Madras.

Auckland Photographic Club.—General Meetings, the second and fourth Thursday in each month. Annual Meeting in October. Club Rooms, Australian Mutual Provident Society's Buildings, Queen Street, Auckland. *Hon. Secretary*—G. R. Boulton.

Ballarat Amateur Photographic Association, Victoria, Australia.—(ESTABLISHED 1886.)—Meetings are held at the School of Mines, Ballarat. *President*—W. H. Wooster. *Vice-President*—J. Fletcher. *Committee*—The Officers, with Miss Baker and Miss Oddie. *Treasurer*—J. J. Young. *Secretary*—Fred Foster, 146 Lydiard Street, Ballarat, Victoria, Australia.

Who makes your Half-Tone Blocks?

Barossa Camera Club, Nuriootpa, South Australia.—*Hon. Secretary*—Walter J. Ponder.

Canterbury Philosophical Institute (Photographic Section), Christchurch.—Meetings held on second Monday in each month. *Secretaries*—S. Page and Walter Burke.

Cape Town Photographic Club.—(ESTABLISHED 1890.)—Meetings are held at the Y.M.C.A. Hall, Cape Town. Annual Meeting, second Wednesday in November. Monthly Meeting, second Wednesday. *President*—David Gill, LL.D., F.R.S., &c., Astronomer Royal at the Cape. *Vice-President*—D. C. Andrew. *Past Vice-Presidents*—T. W. Cairncross, A.M.I.C.E.,, F.I.Inst., and F. Ayers. *Council*—R. E. Brounger, A. Gracie, G. N Lindup, R. T. Pett, F.R.A.S., E. J. Steer, J. R. Wignall, C. Ray Woods. *Secretary and Treasurer*—Andrew James Fuller, 37 Grave Street.

Dunedin Photographic Society.—Meetings, third Wednesday in each month, in Union Chambers. *Secretary*—R. A. Ewing, c/o New Zealand Drug Company.

Foochow Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Club Rooms. *President*—G. Siemssen. *Vice-President*—F. J. Rentzsch. *Hon. Treasurer*—H. W. Churchill. *Hon. Secretary*—J. Mencarini, Foochow, China.

Gordon College Amateur Photographic Association.—Meetings held at Gordon College, Geelong, Australia, on the second and fourth Fridays in each month. *President*—H. G. Roebuck. *Vice-Presidents*—R. C. Hocking and J. B. Leitch. *Treasurer*—A. Purnell. *Secretary*—J. Hammerton, jun., 73 Little Ryrie Street, Geelong, Australia.

Hamilton Association Camera Club.—(ESTABLISHED 1892.)—Headquarters, Museum, Main Street, West. Annual meeting, April. Meetings, last Tuesday of each month. *Secretary and Treasurer*—Wm. White, 9 James Street, North, Hamilton, Ontario, Canada.

Ipswich and West Moreton Amateur Photographic Society, Queensland, Australia.—(ESTABLISHED 1893.)—Meetings on the second Wednesday of each month. Annual Meeting in the month of July of each year. *Hon. Secretary*—Mr. E. Bostock, Brisbane Street, Ipswich, Queensland, Australia.

Kimberley Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Club Rooms. *President*—James Lawrence, M.L.A. *Chairman*—Montague Thane. *Vice-Chairman*—F. H. Hancox. *Council*—J. Childs, E Goffe, L. Atkinson. *Secretary and Treasurer*—Charles Howie, P.O. Box 233, Kimberley, S.A.

Melbourne Working Men's College Photographic Society.—Meetings are held at Latrobe Street, on the first Tuesday in each month. *Secretary*—Leopold Goodwin,

Morgan & Kidd
Richmond

Montreal Camera Club.—(Established 1890. Incorporated 1892.)—Place of Meeting, 4 Phillips Square, Montreal. Annual Meeting, first Tuesday in May. Regular Meetings, first and third Tuesdays from October to May inclusive. *President*—Edward Stanger. *Vice-President*—A. J. Ferguson. *Committee*—George Sumner, Howard T. Barnes, Frank R. Redpath, Charles Lester, George McDougall, Nevill Norton Evans. *Treasurer*—A. Clarence Lyman. *Secretary*—Alfred W. Cole, 28 Victoria Street, Montreal, Canada.

Nelson (New Zealand) Camera Club.—Meetings are held on the third Friday in each month. *President*—C. T. Fell. *Committee*—Messrs. Glasgow, Pitt, Brusewitz, and Jackson. *Custodian*—F. Moore. *Secretary and Treasurer*—Arthur H. Patterson, care of Messrs. Sclanders & Co., Nelson, New Zealand.

Northern Tasmania Camera Club.—(Established 1889.)—Meetings held on the third Wednesday in each month at Mr. R. L. Parker's rooms, St. John Street. *Secretary*—F. Styant Browne.

N.S.W. Lands Department Photographic Society.—Meets last Thursday in each month. *Secretary*—O. W. Ballhausen.

Oudtshoorn Camera Club.—(Established 1895.)—*President*—F. Pfuhl. *Vice-President*—H. Ross. *Council*—F. Pfuhl, H. Ross, S. Wernikoff, B. Bergh, R. Blore. *Treasurer*—B. Bergh. *Secretary*—R. C. Blore.

Photographic Association of Canada.—(Established 1884.)—Place of meeting, Toronto. *President*—H. F. Johnson. *Vice-Presidents*—A. G. Pittaway (Ottawa) and J. F. Jackson (Barrie). *Executive Committee*—The Officers. *Treasurer*—J. G. Ramsay (Toronto). *Secretary*—E. Poole, St. Catharine's, Ontario.

Photographic Society of India.—(Established 1886.)—Meetings are held at 57 Park Street, Calcutta. *President*—Colonel J. Waterhouse, S.C. *Vice-Presidents*—J. S. Gladstone and P. Donaldson. *Committee*—T. H. S. Biddulph, N. Giannacopulo, W. H. Jobbins, E. Moreau, T. A. Pope, E. M. Showers, Maharajkunsar P. K. Tagore, A. Tocher, T. H. Wilson. *Hon. Treasurer.*—Thos. C. Downing. *Hon. Secretary*—Arthur Casperoz, 57 Park Street, Calcutta.

Photographic Society of Japan.—(Established 1889.)—*President*—Viscount Enomoto, Minister of Education for Japan. *Vice-Presidents*—Professor D. Kikuchi, M.A. (Cantab.), Dr. W. S. Bigelow, Kajima Seibei, Dr. E. Baelz. *Treasurer*—Y. Ishizu. *Secretaries*—Professor H. Ishikawa and Professor W. K. Burton.

Quebec Camera Club.—(Established 1887.)—Meetings are held at Captain Imlah's Quarters, The Citadel. *President*—Captain J. George Garneau. *Committee*—Captain W. E. Imlah and J. B. Amyot. *Treasurer*—James Brodie. *Secretary*—Captain Ernest F. Würtele, R.L., Box 1117, Quebec, Canada.

Queensland Amateur Photographic Society.—(ESTABLISHED 1887.)—General Meetings are held on the fifteenth of each month at the Contractors' Exchange, Courier Buildings, Queen Street, Brisbane. *Hon. Secretary*—D. Mactaggart.

Singapore Amateur Photographic Society.—Meetings are held at 53 Hill Street, Singapore. *President*—E. J. Nanson. *Committee*—A. W. Bean and G. Brinkworth. *Treasurer*—F. M. Elliot. *Secretary*—E. F. Gros, Singapore.

South Australian Photographic Society.—(ESTABLISHED 1885.)—Meetings held on the second Thursday of each month in the Chamber of Manufactures, North Terrace, Adelaide. *President*—C. F. Clough, Assoc. M. Inst. C.E. *Vice-President*—E. W. Belcher. *Committee*—The Executive Officers, G. Stace, P. A. Roberts, A. W. Dobbie. *Hon. Librarian*—J. D. Dixon. *Hon. Treasurer*—R. B. Adamson. *Hon. Secretary*—A. H. Kingsborough, Childers Street, North Adelaide.

Southland Camera Club, New Zealand.—Meetings, second Thursday in each month. *Secretary*—H. A. Macdonald.

Sydney Amateur Photographic Society.—Meetings on the second Thursday in each month. *President*—E. L. Montefiore. *Vice-Presidents*—H. Paterson and J. H. Simpson. *Hon. Secretary*—Henry Chapman, 143 King Street, Sydney.

Toronto Camera Club.—(ESTABLISHED 1887, INCORPORATED 1893.)—Place of Meeting, corner of Yonge and Gerrard Streets, Toronto, Canada. Annual Meeting, first Monday in November. Meetings every Monday at Eight p.m. from October 1 to April 1. Member of the American Lantern Slide Interchange. *President*—Edmund E. King, M.D. *Vice-Presidents*—W. H. Moss and G. R. Baker. *Committee*—Hugh Neilson, J. G. Ramsey, A. W. Croil, W. B. Varley, A. R. Blackburn, Bert Smith. *Secretary and Treasurer*—Ernest M. Lake, 14 King Street West, Toronto, Canada.

Tasmanian Photographic, Science, and Art Association, Hobart.—(ESTABLISHED 1887.)—Meetings are held at the Royal Society's Museum on the second Friday in each month. *Secretary*—H. J. Buckland.

Victoria Camera Club.—(ESTABLISHED 1887.)—Meetings held at the Victoria Coffee Palace. *President*—Hon. F. S. Dobson, LL.D. *Vice-President*—A. M. Henderson. *Committee*—J. Pettigrew, A. Harper, H. B. Clutten. *Secretary and Treasurer*—Alfred Henry Farmer, 54 Elizabeth Street, Melbourne.

Wanganui Camera Club, New Zealand.—*President*—A. Elliott. *Hon. Secretary*—D. Meldrum.

Wellington Camera Club.—(ESTABLISHED 1892.)—Meetings are held on the second Friday in each month in Exchange Buildings, Lambton Quay. *Hon. Secretary*—W. Snodgrass, Exchange Buildings, Lambton Quay, Wellington, New Zealand.

West Australian Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Perth. *Patron.*—Sir Wm. C. F. Robinson, G.C.M.G. *President.*—Sir John Forrest, K.C.M.G. *Vice-Presidents.*—Sir George Shenton, Kt., M.L.C., Hon. S. H. Parker, M.L.C., Lt.-Col. Phillips. *Council.*—H. R. England, W. J. Hancock, H. Kelsall, M.D., H. J. Pether, W. Bacon. *Treasurer.*—W. M. Atkins. *Secretary.*—A. R. L. Wright, Public Works Department, Perth.

CONTINENTAL PHOTOGRAPHIC SOCIETIES.

Amateur Fotografen Vereeniging at Amsterdam. Established September 1, 1887. Headquarters and Studio, Handboogstraat 2. Meetings, Wednesday, fortnightly. Ign. Bispinck, President. W. H. D. Witt, Librarian. Geo. Peck, Commissary. A. W. de Flines, Treasurer. D. Wilmerink, Handboogstraat 2, Secretary.

Association Belge de Photographie.—Established 1874. Meetings are held at Louvain. Joseph Casier, President. J. Maes and F. Massange de Louvrex, Vice-Presidents. A. Canfyn, L. Lasureux, Alb. Lunden, A. Nyst, G. Oury, Ch. Puttemans, A. Rutot, J. Savoné, V. Selb, — Stappers, and H. Vassal, Committee. M. Boschmans, Treasurer. M. Vanderkindere, 97 Avenue Brugmann, Uccle, Bruxelles, Secretary.

Association Nationale des Photographes Amateurs.—Fondée le 15 Mars, 1894, et autorisée par arrêté préfectoral du 22 Décembre suivant. Place of Meeting, au domicile du Président, actuellement à Châteaugiron (Ille-et-Vilaine). Alfred Savary, President. Paul Faucher, Vice-President. MM. Cosnard, Le Millier, Marnelle, and Le Sage de Lahaye, Committee. Roul de la Hellière, Secretary and Treasurer.

Deutscher Photographen Verein.—Established 29 December, 1876. Place of Meeting, Weimar. Annual Meeting, August, 1896, at Trier. K. Schwier, President. C. Kindermann, Vice-President. K. Schwier, C. Kindermann, Gg. Alpers, jun., C. Kesselhuth, Fr. Langbein, and Karl Wunder, Committee. K. Schwier, Weimar, Secretary and Treasurer.

Cercle des Effigistes (Amis Photographes) Genève.—Café Delaigne, Rue du Stand, 9. Fondé le 1er Juillet, 1889. Edouard May, Président. Francis Mazuy, Vice-Président. Amédée Barral, Trésorier. Eugène Dovaz, Secrétaire.

Dansk Fotografisk Forening.—Established 1879. Monsieur J. Petersen, Photograph de la Cour (R. Officier d'Académie Francaise), President. Fr. Rüse, cand. phil. Photograph, Vice-President. E. Móller, Photograph, Mdll. Mary Steen, Photograph de la Cour, Monsieur C. F. Pechüle, Astronom. (R. St. A. 3), Council. F. P Steenbro, Fabricant, Treasurer. Chr. Christensen, Photograph, 31, Amagertow, Copenhague, Secretary. Ordinary Meeting the last Wednesday in every month from September to April.

Deutsche Gesellschaft von Freunden der Photographie in Berlin.—Meldungen zum Beitritt für die Deutsche Gesellschaft von Freunden der Photographie nehmen die Mitglieder des Vorstandes entgegen und versenden dieselben auf Wunsch die 'Satzungen' der Gesellschaft. Näheres durch den Schriftführen Herrn Direktor Schultz-Hencke, Lette-Institut, Berlin S.W., Königgrätzer-strasse 90. Der Jahresbeitrag beträgt M.20,00. für Auswärtige jährlich M.14.

Gröninger Amateur Photographen Vereeniging 'Daguerre.'—Established 1891. W. H. de Witt, President. C. A. M. van Riet, Treasurer. L. A. Dokkum, Member of the Committee. R. Roelfsema Pzu, Steenhouwerskade, Greningen, Secretary.

Haarlemsche Amateur Fotografen Club.—Established 1891. F. Y M. Huijsser, President. C. G. H. Bakker, Treasurer. Y. Bes, 9 Wilsonsplein, Haarlem, Secretary.

Le Photo Velo Club de Paris.—M. Violette, 21 Boulevard St. Germain, Paris, France, Secretary.

Münchener Photographische Gesellschaft.—Established 1871. Place of Meeting, München 'Deutsches Haus' E. Martin, President. F. X. Ostermayr and Otto Wernhard, Committee. Otto Wernhard, Treasurer. F. X. Ostermayr, Secretary. Address of Society, Otto Wernhard, München Sonnen Strasse, 24.

Nederlandsche Vereeniging van Dilettant Photographen 'Helios.'—Established, 1872. Meetings held at the Photographic Studio and Club Rooms of the Society, Spui, Amsterdam. P. Fraisfinet, President. D. van Haren Noman, M.D., Vice-President. J. van Geuns, M.D., and J. van Rees, M.D., Committee. C. H. A. Westhoff, M.D., Treasurer. J. C. A. Wertheim Salomonson, M.D., 139 Stadhouderskade, Amsterdam, Secretary.

CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

PHOTO-CLUB DE PARIS.—Established 1888. Place of Meeting, 40 Rue des Mathurins, Paris. Maurice Bucquet, President. Em. Mathieu, Vice-President. M. Binder, M. Brémard, Dr. Tousselin, P. Gers, P. Naudot, and Toutain A. Darnis, Committee. H. Guérin, Treasurer. P. Bourgeois, 40 Rue des Mathurins, Paris, Secretary.

PHOTOGRAPHISCHE GESELLSCHAFT IN WIEN.—Established 1861. Place of Meeting, Palais der Akademie der Wissenschaften, Wien. Ottomar Volkmer, President. Dr. Carl Böhm von Böhmersheim, Vice-President. Carl Augerer, Emil Ritter von Arlater, Wilhelm Burger, Dr. J. M. Eder, Michael Frankenstein, Adalbert Franz, Josef Löwy, Dr. Wilhelm Freiherr von Schwarz-Senborn, Robert Sieger, Josef Ungar, and Louis Zwickl, Committee. Ludwig Schrank, Treasurer. Dr. Josef Székely, Secretary. Office, Wien II. Karmelitergasse, No 7.

PHOTOGRAPHISCHE GESELLSCHAFT, HAMBURG, ALTONA.—Established November 4th, 1873. G. Wolf, Hamburg, President. Th. Petersen, St. Pauli, Vice-President. Herm. Boock, C. W. Lüders, Kunstschleifer, Committee. W. Köhnen, Altona, Treasurer. H. Boock, Bergstrasse, 26. Meets first Tuesday in the month, at 8 p.m., at Gerhafstrasse, 10, Hamburg.

PHOTOGRAPHISCHE VEREIN ZU BERLIN.—Established 1863. Place of Meeting, Berlin. P. Grundner, President. T. C. Schaarwaechter, Vice-President. Herren Stoll, Cornand, Gerike, Himly, and Schultz-Hencke, Committee. E. Martini, Treasurer. Dr. A. Miethe (Hon Fellow of the Royal Photographic Society), Braunschweig, Lachmannst., 7, Secretary.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE.—Established 1854. Place of Meeting, 76 Rue des Petits-Champs, Paris. M. le docteur Marey, President. M. Davanne, Vice-President. MM. Davanne (Président), Le Général Lebert and Bardy (Vice-Présidents), Perrot de Chaumeux (Secrétaire Général), Sector and Londe (Secrétaires Généraux adjoints), Audra (Trésorier), Bordet (Bibliothécaire), Chardon, Gauthier-Villars, Gobert, De St. Senoch, G. Rolland, Thouroude, and De Villecholle (Membres), Aimé Girard and Adolphe Martin (Membres honoraires), and E. Cousin (Sécrétaire agent), Committee. M. Audra, Treasurer. M. Perrot de Chaumeux, 1 Rue Malleville, Enghien-les-Bains, Secretary.

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. M. du Hanlay, Lieut.-Colonel, President. M. Toublanc, Vice-President. Ch. Planté, H. Bureau, P. du Minehy, Committee. M. Tassain, Treasurer. Paul Crémant, Rue d'Alger, 13, Nantes, Secretary, and Pierre Courant, Assistant Secretary. Réunion le premier vendredi de chaque mois, au Cercle des Beaux-Arts.

SOCIÉTÉ VERSAILLAISE DE PHOTOGRAPHIE.—Established 1884. Séances de la Société les premiers Mardis de chaque mois à la Mairie à 8 heures et demie du soir. Maurice Bucquet, President. L. Ottenheim, Vice-President. Comité d'administration, Committee. M. Gavin, Treasurer. Jessé Curely, 20 Rue de Provence, Versailles, Secretary.

VEREIN FÜR FÖRDERUNG DER PHOTOGRAPHIE IN BERLIN.—Established 1869. Professor Dr. H. W. Vogel, President. Dr. W. Zenker, Vice-President. Professor Dr. H. W. Vogel, Dr. Zenker, Photochemiker Schultz-Hencke, L. Christmann, A. Bergmann, Hofphotograph H. Graf, A. Halwas, P. Loescher, and Maler Milster, Committee. A. Bergmann (Adresse F. Beyrich, Berlin N. Linienstrasse, 114), Treasurer. Photochemiker, Schultz-Hencke, Berlin-Charlottenburg, Kgl. Technische Hochschule, Secretary.

VEREIN PHOTOGRAPH MITARBEITER ZU BERLIN. — Vereinslocal, Stralauersstrasse, 57. H. Aschenbrenner, President. G. Kintzel, Vice-President. A. Judten. berg, Strelizer-strasse, 67, Treasurer. Eduard Günther, N., Zionskirch-strasse, 37II. Secretary.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KÜNSTE, FRANKFURT A. MAIN.—Established 1875. Docent am der technischen Hochschule, F. Schmidt, President. H. Maas, Vice-President. T. H. Voigt, C. Ruf, W. Pöllot, Dr. C. Kleinschmidt, and J. E. Rumpel, Committee. C. Böttscher Treasurer. Dr. A. Shebel, Protocoll Secretary. Th. Haake, Frankfurt a. Main, Correspondenz Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Agassiz Association, Manhattan Chapter, New York.—Established 1880. Meetings held at 141 East Fortieth Street, New York City. Christian F. Groth, President. Charles Kromm, Vice-President. H. T. Rowley, W. T. Demarest, Frederick Kromm, Eugene Staubsandt, and H. Breunich, Committee. William S. Miller, Treasurer. Edward B. Miller, 141 East Fortieth Street, New York City, Secretary.

Akron Camera Club.—Meetings are held at residences of members on the second Tuesday of each month. Professor C. M. Knight, President. Edward Terrass, Vice-President. Frank Adams, Treasurer. Professor W. D. Shipman, Secretary.

Albany Camera Club.—Organized October 21, 1887. Meetings held at 72 Chapel Street, Albany, N.Y. W. W. Byington, President. Dayton Ball, Vice-President. J. S. Paterson, Charles S. Pease, J. S. Van Buren, Prof. Maurice Perkins, Karl J. Phisterer, T. C. Luitze, Dr. S. B. Ward, and Dr. T. L. Carroll, Directors. Edward D. , Treasurer. Dr. Charles E. Davis, 91½ Hudson Avenue, Albany, N.Y., Secretary.

Amateur Photographic Association (Selma, Alabama).—Established Dec. 29, 1887. Meetings held at the Y.M.C.A. Building. William S. Monk, President. S. Orlando Trippe, Selma, Dallas Co., Alabama, Secretary and Treasurer.

American Lantern Slide Exchange.—Established 1885. Reorganized 1888. Meetings held at 361 Broadway, New York. F. C. Beach, Manager. W. H. Rau, Assistant Manager. W. H. Olmstead, Syracuse, N.Y., U.S.A., Secretary and Treasurer.

Amherst College (Mass.) Camera Club.—Established September, 1890. Meetings held on the second Monday in each month in North College. Robert B. Luddington, President. Edward P. Harris, Ph.D., Amhurst, Mass., Secretary.

Baltimore (Md.) Amateur Photographic Society.—Established April 3, 1885. Meetings at 106 North Charles Street on the third Friday in each month. Harry D. Williar, P. O. Box 344, Baltimore, Md., or 9 and 11 East Camden Street, Secretary.

Boston Camera Club.—Established 1881. Meetings held at the Club Rooms, 50 Bromfield Street, Boston, Mass. George M. Morgan, President. W. S. Briggs, J. P. Lond, and Charles Sprague, Vice-Presidents. The officers, and A. E. Fowler, D. W. Lewis, James Means, F. H. Manning, E. O. Cockayne, C. H. Currier, and F. S. Anable, Committee. Owen A. Eames, Treasurer. Charles H. Perry, 50 Bromfield Street, Boston, Mass., U.S.A., Secretary.

Bridgeton Camera Society.—Established January, 1890. Incorporated March, 1893. Meetings held at 48–50 East Commerce Street, Bridgeton, N.J. Henry A. Janvier, President. George Hampton, Vice-President. Hugh L. Reeves, Howard W. Fithion, and Sydney E. Bower, Managing Committee. Sydney E. Bower, Treasurer. Henry W. Scull, Cumberland National Bank, Bridgeton, N.J., Secretary.

Brooklyn Academy of Science (Photographic Section).—Organized March 26, 1888. J. W. Holbrook, jun., 462 Hart Street, Brooklyn, N. Y., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Brooklyn Institute of Arts and Sciences (Department of Photography).—Established March 29, 1889. J. Frederick Hopkins, President. Myers R. Jones, First Vice-President. George W. Wundram, Second Vice-President. Lewis E. Meeker, M.D., Curator. Edward T. Cockey, Treasurer. Henry L. Underhill, Secretary. Gould W. Hart, 849 Munroe Street, Brooklyn, New York, Corresponding Secretary.

Brooklyn (N.Y.) Academy of Photography.—Established 1887. Social and dark rooms, 517 Fulton Street. Exhibition rooms and hall at the Hoagland Laboratory, Henry Street. John Merritt, M.D., President. F. Dana Reed and Starks W. Lewis, Vice-Presidents. William T. Wintringham, Treasurer. Henry S. Fowler, 578 Halsey Street, Brooklyn, New York, Secretary.

Buffalo (N.Y.) Camera Club.—Established October 10, 1888. Regular Meetings, second Tuesday, at Eight p.m., at Buffalo Medical College. Willis O. Chapin, President. G. Hunter Bartlett, Vice-President. Charles E. Hayes, Treasurer. Charles R. Wilson, 261 George Street, Buffalo, N.Y., Secretary.

California Camera Club.—Incorporated April 5, 1890. Meetings held at the Academy of Sciences Building, 819 Market Street. A. G. McFarland, President. J. E. Thayer, First Vice-President. W. B. Webster, Second Vice-President. H. C. Owens, Librarian. E. G. Eisen, Treasurer. C. F. Cormack, 819 Market Street, San Francisco, California, Secretary. C. S. Close, Corresponding Secretary.

Camera Club of Hartford.—Established February 18, 1885. Incorporated March 8, 1892. Headquarters, 25 Pratt Street. Meetings, second Tuesday of each month. H. O. Warner, President. F. A. Thompson, Treasurer. L. S. Hickmott, P. O. Box 480, Hartford, Connecticut, Secretary. R. A. Wadsworth, P. O. Box 1004, Corresponding Secretary.

Camera Club of the Capitol Bicycle Club.—Established 1893. Club House, 409 Fifteenth Street, Washington, D.C. Meetings, first and third Thursdays in each month. H. G. Douglas, President. A. J. Henry, Secretary and Treasurer.

Camerads of New Brunswick, N.J.—Established March 1887. Meetings held in Rutger's College. Peter T. Austin, Ph.D., President. William D. Horn, Vice-President. George K. Parsell, Frederick Ulrich, jun., and J. Arthur Blish, Council. Charles V. Myers, Treasurer. Harvey Iredell, D.D.S., Lock Box 34, New Brunswick, N. J., Secretary.

Chicago Camera Club.—Established 1888. Meetings are held at 184 Wabash Avenue on the second Tuesday of each month at Eight o'clock. Annual Meeting in April. Rooms always open and in charge of competent attendant. Members of other societies from all parts of the world always welcome, and dark rooms and studio (completely equipped) at their disposal. M. L. Williston, D.Sc., President. M. R. Brown, M.D., and Mrs. N. Gray Bartlett, Vice-Presidents. T. B. Patterson, Treasurer. W. W. Abbott, Secretary.

Chicago Society of Amateur Photographers.—Established 1886. Meetings held at Noonday Rest, 4 East Monroe Street. Thomas W. Sheardown, President. Robert Berger, H. T. Clarke, E. J. Wagner, W. A. Morse, Committee. Marshall Waite, Treasurer. W. A. Morse, 4 East Monroe Street, Chicago, Secretary.

Cleveland (Ohio) Camera Club.—Established January 25, 1887. Meetings held at 5 Euclid Avenue on the first and third Tuesday evenings of each month at Eight p.m. The Annual Meeting is held on the first Tuesday evening in January, unless that Tuesday is the 1st of January, in which case it is deferred until the third Tuesday. Frank Dorn, President. Alfred Ogier, Vice-President. William Dorn, Treasurer. R. Dayton, M.D., 1202 Willson Avenue, Cleveland Ohio, U.S.A., Secretary.

American Photographic Societies—*Continued.*

Colorado Camera Club.—Established 1890. Meetings held at the Colorado Camera Club Rooms, 329 Sixteenth Street, Denver, Colo. Hon. W. H. Jackson, President. C. E. Page, Vice-President. Hon. W. H. Jackson, C. E. Page, H. D. Smith, Miss C. May Gilleland, J. O. Stivers, P. R. Goodrich, and Frank W. Ingersoll, Directors. H. D. Smith, Treasurer. P. R. Goodrich, 329 Sixteenth Street, Denver, Colo., Secretary.

Columbia College (N. Y.) Amateur Photographic Society.—Established 1886. Meetings at Columbia College twice a month. Henry R. Taylor, President. Dwight Taylor, Treasurer. H. M. Brookfield, Secretary.

Columbian College (Washington, D. C.) Camera Club.—Established 1888. Ordinary Meetings at Columbian College, Washington, D. C., every Wednesday afternoon. Allan J. Houghton, President. Edwin W. Ashford, Vice-President. W. B. Asmussen, Librarian. A. J. Houghton, Treasurer. Charles P. Spooner Secretary.

Columbia Photographic Society.—Organized December 7, 1889. Incorporated 1894. Meetings are held at 1507 Columbia Ave., Philadelphia, Pa., U.S.A. Dr. G. J. R. Miller, President. W. P. Buchanan, Vice-President. Dr. G. J. R. Miller, W. P. Buchanan, John N. Reeve, Benj. L. Berry, Herbert E. Havens, Rudolph Pott, and John P. Kolb, Board of Directors. John N. Reeve, 203 Walnut Place, Room 4, Philadelphia, Pa., Secretary and Treasurer.

Columbus (Ohio) Camera Club.—Established October 6, 1884. Rooms, Y.M.C.A. Building. Regular Meetings, third Thursday of each month except July and August at half-past Seven p.m. Annual Meeting, third Thursday of December. John Field, President. C. H. Doty, Vice-President. C. S. Bradleys, Treasurer. J. J. Jennings, Secretary.

Daguerre Camera Club.—Established 1889. Meetings held at 185 Fortieth Street. W. Bradford, President. Wells B. Sizer, 189 State Street, Chicago, Ill., Treasurer and Secretary.

Delaware Camera Club.—Established 1891. Headquarters in its Club Rooms in the Equitable Building, Wilmington, Delaware. Regular Meetings are held on the first Thursday of each month. John M. Rogers, President. Miss Rachel S. Howland, Vice-President. Willard C. Jackson, Corresponding Secretary.

Detroit Lantern Club.—Established January, 1891. Meetings held at the Museum of Art. Frank E. Kirby, President. A. D. Noble, jun., Director. D. Farrand Henry, 52 Woodward Avenue, Secretary and Treasurer.

Detroit (Mich.) Amateur Photographic Society.—Established October 1, 1889. Meetings at Society Rooms, 42 State Street, on the second Monday in each month. James Joy, President. D. Farrand Henry, Treasurer. Joseph E. Lockwood, Secretary.

Dixon Camera Club.—Established 1893. Meetings are held at Brown's Gallery, Dixon, Ills. E. E. Shaw, President. Mrs. C. W. Shick, Vice-President. Henry A. Brown, Treasurer. G. H. T. Shaw, Dixon, Ills., Secretary.

Elizabeth Camera Club.—Established May, 1892. Meetings are held at 96 Broad Street. D. R. Blackford, President. James A. Woodward, Vice-President. Dr. E. D. Frost, James A. Knowles, J. G. Green, James A. Woodward, T. F. McCarty, Victor Myers, and Howard C. Williams, Committee. J. A. Knowles, Treasurer. N. C. Darby, 96 Broad Street, Elizabeth, N.J., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

German Photographic Society of New York.—Established 1868. Ordinary Meetings at 62 East Fourth Street, New York City, on the second and fourth Wednesdays of every month at quarter-past Eight o'clock p.m. A. Mildenberger, President. Otto Buehler, Vice-President. G. E. Pellnitz, Treasurer. L. Schill, Financial Secretary. H. G. Borgfeldt, 850 Broadway, Brooklyn, Corresponding Secretary.

Harvard Camera Club.—Established 1889. Headquarters, Harvard University, Cambridge, Mass. Annual meeting, June. Meetings monthly. P. P. Sharples, President. H. Emerson, Vice-President. J. G. M. Glessner, 8 Hastings Hall, Cambridge, Mass., Secretary and Treasurer.

Hoboken Camera Club.—Established March 22, 1889. The Regular Meetings of the Club take place the first Tuesday of each month. The Board of Governors meet the third Friday of each month. The Annual Meeting of the Club takes place the first Tuesday in March, when the election of officers takes place for the ensuing year. All Meetings are held at 1036 Park Avenue, Hoboken, N.J. A. J. Thomas, President. C. Sudhaus, Vice-President. Three Trustees (W. Schrader, A. Beyer, and E. E. Wooley), all the Officers of the Club, the House Committee (F. A. Muench and L. R. Trickel), and the Entertainment Committee, Board of Governors. William Allen, Custodian. H. J. Kultenbach, Treasurer. A. L. Smith, 1045 Bloomfield Street, Hoboken, N.J., U.S.A., Secretary.

Irvington (N.J.) Art and Camera Club.—Established 1892. Meetings held at Irvington, N.J., U.S.A. Edwin D. Harrison, President. F. H. Morrell, Vice-President. James Peckwell, jun., Treasurer. Melton Tompkins, Secretary.

Lowell Camera Club.—Organized 1889. Incorporated 1892. Meetings are held at the Central Block. Paul Butler. President. William P. Atwood and F. T. Walsh, Vice-Presidents. The officers, and Charles Runels, Arthur Staples, and Fay H. Martin, Executive Committee. M. A. Taylor, Treasurer. George A. Nelson, 91 Mansur Street, Lowell, Massachusetts, Secretary.

Lynn Camera Club.—Established January 1, 1888. Incorporated December 20, 1889. Regular Meetings, first Tuesday in each month. Annual Meeting, first Tuesday in January. All Meetings held at the Club House, 42 Broad Street. William H. Drew, President. J. N. Smith, Vice-President. W. H. Drew, J. N. Smith, J. W. Gibboney, A. J. Purinton, E. F. Bacheller, A. H. Carsley, W. B. Gifford, and W. A. Pevear, Committee. E. F. Bacheller, Treasurer. C. A. Lawrence, Club House, 42 Broad Street, Lynn, Mass., Secretary.

Mattapan Camera Club.—Established May, 1890. Meetings held at the private residence of members. John A. Locklin, President. Walter Hertzberg, Vice-President. Alfred L. Karcher, Treasurer. Erdmann Sonnenbrodt, P.O. Box 83, Mattapan, Mass., Secretary.

Memphis Camera Club.—Established 1893. Meetings held at the Rooms, 126, 128 Randolph Building. S. J. Latta, President. J. B. Heiskell, Vice-President. Geo. O. Friedel, 370 Second Street, Memphis, Tenn., U.S.A., Secretary and Treasurer.

Minneapolis Camera Club.—Established 1892. Meetings held at 15 North Fourth Street. W. B. Augir, President. W. H. McMullen, Vice-President. H. E. Murdock, E. De Parcq, J. B. Lee, jun., C. A. McCollom, M.D., George W. Beach, and the President, Vice-President, Secretary, Treasurer, Board of Directors. A. S. Williams, Treasurer. C. J. Hibbard, 17 South Fourth Street, Minneapolis, Minn., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Mystic Camera Club.—Organized June 4, 1889. Incorporated March 17, 1891. Meetings held at 28 Main Street, Medford, Mass., U.S.A. John F. Wade, President. Charles A. Clark, Vice-President. The four Officers, and Charles A. Staniford, E. B. Conant, and J. Manning Foster, Executive Board. Joseph B. Thaxter, jun., Treasurer. Warren M. Archibald, 8 South Street, Medford, Mass., U.S.A., Secretary.

Newark (N.J.) Camera Club.—Established April 18, 1888. Meetings are held at 224 Market Street, Newark, N.J. William Archibald, President. D. S. Plumb, Vice-President. Harry W. Smith, P. L. V. Thiery, F. S. Olds, W. A. Halsey, A. C. Munn, F. A. Schuetz, Miles I'Anson, Colonel A. J. Clark, and Abraham Van Winkle, Executive Committee. J. M. Foote, Treasurer. D. S. Plumb, 24 Boudinot Street, Newark, N.J., Secretary.

New Britain Camera Club.—Established 1892. Headquarters, 210 Main Street. Annual meeting, January. Meetings, second and fourth Tuesdays in each month. E. M. Hulbert, President. R. S. Brown, Vice-President. Jas. Shepard, C. F. Chase, R. H. Russell, and A. F. Norton, Board of Control. F. B. Wood, 273 Main Street, New Britain, Conn., Secretary and Treasurer.

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New Orleans Camera Club.—Established December 17, 1886. Meetings are held at 712 Union Street, New Orleans, La. Hon. Bernard C. Shields, President. S. L. Mitchel, Vice-President. B. C. Shields, S. L. Mitchel, R. S. Charles, jun., H. C. Delery, L. E. Bowman, J. Theo. Tudury, William Gowland, and P. Reynes, Board of Directors. H. C. Delery, Treasurer. R. S. Charles, jun., Care of Illinois Central R. R. Co., Howard Avenue and Rampart Street, New Orleans, La., Secretary.

Newton Camera Club.—Established 1893. Meetings held at the Club House, Brookside Avenue. Dr. E. B. Hitchcock, President. J. W. Barber, Vice President. Chas. H. Fewkes, Secretary and Treasurer.

New York Camera Club.—Established 1888. Meetings are held at 314 Fifth Avenue, New York. Samuel W. Bridgham, President. Franklin Harper, Vice-President. Robert J. Devlin, Treasurer. Chas. W. Stevens, 314 Fifth Avenue, New York, Secretary.

Old Colony (Rockland, Mass.) Camera Club.—Meetings at Smith Building, Liberty Street, on the first and third Fridays of every month. Daniel Smith, President. Emery H. Jenkins, Vice-President and Treasurer. Silas Gurney, Box 546, Rockland, Mass., U.S.A., Secretary.

Oneida Camera Club.—Established February, 1894. F. C. Cheney, President. H. K. Noyes, Vice-President. Albert Dygett, Treasurer. E. B. Noble, Oneida, N.Y., U.S.A., Secretary.

Orange (N.J.) Camera Club.—Established 1892. Meetings held at 222 Main Street. W. H. Cheney, President. J. L. Seward, M.D., Vice-President. W. T. Baird, Treasurer. H. R. Terhune, Secretary.

Paterson Camera Club.—Established 1893. Meetings held at the Y.M.C.A. Building, Ellison Street. C. M. Giles, President. H. W. Gledhill, Vice-President. Wm. M. Moore, Treasurer. Chas. D. Cooke, Cooke Locomotive Works, Paterson, N.J., U.S.A., Secretary.

Photographers' Association of America.—J. S. Schneider, President. R. P. Bellsmith and Geo. Steckel, Vice-Presidents. J. E. Rösch, Treasurer. P. MacDonald, Albany, N.Y., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Photographers' Association of Iowa.—Established 1890. Meetings held at Des Moines, Iowa. W. O. Reed, President. M. G. Maxwell and J. F. Specht, Vice-Presidents. The Officers of the Association, Committee. T. A. Brown, Treasurer. J. R. Hall, Monroe, Iowa, Secretary.

Photographers' Association of Missouri.—W. E. Nottingham, President. W. L. Nichols and B. F. Mathis, Vice-Presidents. M. Patterson, Treasurer. Edwin Thomas, Bevier, Mo., U.S.A., Secretary.

Photographers' Association of Ohio.—Office of Executive Committee, Hamilton, Ohio. A. L. Bowersox, President. George H. Barnum, Springfield, Ohio, U.S.A., Secretary.

Photographical Section of the American Institute.—Established March 26, 1859. Meetings are held at 111, 113, 115 West Thirty-eighth Street, New York City. Henry J. Newton, President. Cornelius Van Brunt, Vice-President. Executive Committee and Committee on Chemistry and Optics, Committee. William Dean, Treasurer. Oscar G. Mason, Photographical Department, Bellevue Hospital, New York City, Secretary.

Photographic Club of Baltimore City (Md.).—Established May, 1891. Meetings are held at Madison and Eutaw Streets, Baltimore City, Md. A. S. Murray, President. Dr. Frank Slothower, Vice-President. A. S. Murray, Dr. F. Slothower, A. J. Godby, F. W. McAllister, B. G. Buck, E. M. Barker, and Charles E. Needles, Board of Directors. E. M. Barker, Treasurer. Charles E. Needles, 404 Cathedral Street, Baltimore, Md., Secretary.

Photographic Society of Kansas City, Mo.—Established September 1, 1890. Meetings are held at 1431 Walnut Street, Kansas City, Mo. J. P. Reymond, President. Dr. William T. Stark, Vice-President. President, Vice-President, and Secretary, Executive Committee. Carl K. Bowen, Treasurer. Charles H. Clarke, 613 Delaware Street, Kansas City, Mo., Secretary.

Photographic Society of Philadelphia.—Established November, 1862. Meetings held at 10 South Eighteenth Street, Philadelphia, Pa., U.S.A. Joseph H. Burroughs, President. Charles R. Pancoast and Robert S. Redfield, Vice-Presidents. John C. Browne, John G. Bullock, Samuel Castner, J. Hunter Ewing, Alexander Hemsley, William N. Jennings, Charles L. Mitchell, M.D., Albert B. Parvin, William H. Rau, Anthony W. Robinson, Samuel Sartain, and Benjamin Sharp, M.D., Directors. George Vaux, jun., Treasurer. Edmund Stirling, care *Public Ledger*, Philadelphia, Secretary.

Pittsburg (Pa.) Amateur Photographers' Society.—Meetings held at the Academy of Science and Art, Pittsburg, Pa., on the second Monday of each month. W. S. Bell, President. W. J. Hunker, Treasurer. J. H. Hunter, 248 Centre Avenue, Pittsburg, Pa., Secretary.

Pittsfield Camera Club.—Established 1892. Meetings held at Pittsfield, Mass., on the second Wednesday in each month. A. N. French, President. J. F. Middleton, Vice-President. Allen H. Bagg, Treasurer. W. D. Goodwin, 120 Elizabeth Street, Pittsfield, Mass., U.S.A., Secretary.

Plainfield (N. J.) Camera Club.—Established June 7th, 1888. Incorporated September 7th, 1890. Meetings held at the Rooms in Babcock Building, West Front Street. Oscar S. Teale, President. John E. Stewart, Vice-President. O. S. Teale, J. E. Stewart, Harold Yerrell, H. H. Coward, J. Hervey Doane, Howard Y. Stillman, Board of Directors. Harold Serrell, Treasurer. Harry H. Coward, 245 East Front Street, Plainfield, N.J., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Portland Camera Club.—Established February 6, 1890. Meetings held at the Society of Arts Rooms, Deering Place. Stanley P. Warren, M.D., President. Nathan Clifford, Vice-President. Franklin M. Lawrence, Harry Levy, F. H. Little, William Sweat, Executive Committee. Clayton T. Whipple, Treasurer. Frederick Fox, jun., 77 State Street, Portland, Secretary.

Postal Photographic Club.—Professor Randall Spaulding, President. F. P. Fairbanks, 11 Day Street, Fitchbury, Mass., Secretary and Treasurer.

Providence Camera Club.—Established 1883. Incorporated 1889. Meetings held at the Club Rooms, 87 Weybosset Street, Providence, R.I. Annual Meeting, first Tuesday in June. Regular Meetings, first Tuesday in each month. R. Clinton Fuller, President. W. Penn Mather, Vice-President. R. Clinton Fuller, Frederick P. Wilbur, Joseph A. Miller, jun., J. Eliot Davison, Charles A. Stoddard, W. A. Dean, E. A. Darling, E. Q. Gladding, and S. B. Burnham, Executive Committee. E. A. Darling, Treasurer. Frederick P. Wilbur, Recording Secretary. J. Eliot Davison, Pawtucket, R.I., Corresponding Secretary.

Putnam (Conn.) Camera Club.—Established January, 1888. Headquarters at its Club Rooms, Putnam, Connecticut. Regular Meetings are held on the first Friday in each month. The Annual Field Day occurs on the first Wednesday in June. George E. Dresser, President. Edward F. Whitmore, Treasurer. Eric H. Johnson, Putnam, Connecticut, Secretary.

Richmond (Va.) Camera Club.—Established April 1, 1890. E. F. C. Davis, President. R. A. Lancaster, jun., Vice-President. Professor Charles H. Winston, Dr. Philip Taylor, R. M. Blankenship, R. A. Lancaster, jun., and C. D. Habliston, Executive Committee. C. D. Habliston, 630 East Main Street, Richmond, Va., Secretary and Treasurer.

San Diego (Cal.) Camera Club.—Established 1892. Meetings are held at D Street between Fourth and Fifth Streets. Dr. Joseph Rhodes, President. Charles Wellborn, Vice-President. Laura B Anderson, Treasurer. W. W. Whiston, Club Rooms, D Street, San Diego, Cal., U.S.A., Secretary.

Schuylkill Camera Club.—Established July 5, 1889. Meetings are held at South Center Street, Pottsville, Penn., U.S.A. A. W. Sheager, President. Miss Elena Roads, Vice-President. The Officers constitute Committee. W. L. Sheager, Treasurer. B. S. Simonds, 400 Mahantongo Street, Pottsville, Penn., Secretary.

Sociedad Fotografica Mexicana.—Organized in the City of Mexico, July 6th, 1890. Place of meeting, City of Mexico. Ordinary meetings, two Sundays each month. Fernando Ferrari Perez, President. Manuel G. Prieto, Vice-President. Guilermo By Puga, Dr. Fernando Altamarino, Ignacio Molina, and Manuel Buen Abad, Executive Committee. Prof. Francisco Rio de la Loza, Librarian. Luis G. Ruiz, Treasurer. Engineer Vicente Vargas Galeana, Secretary.

Society of Amateur Photographers of New York.—Established March 10, 1884. Meetings are held at 113 West Thirty-eighth Street. C. C. Roumage, President. Dr. J. H. Stebbins, jun., Vice-President. Dr. J. T. Nagle, E. T. Birdsall, Albert Stetson, Louis T. Brush, C. W. Canfield, Harry Coutant, G. F. Basset. and Frank M. Hale, Board of Directors. W. E. Johnson, Treasurer. R. L. Bracklow, Recording Secretary. T. J. Burton, 113 West Thirty-eighth Street, New York City, Corresponding Secretary.

Springfield (Mass.) Camera Club.—Established October, 1886. Meetings are held at the Club Rooms, corner of State and Dwight Streets. Henry C. Haile, President. Henry C. Haile, William M. Lester, Charles C. McElwain, William B. Sleigh, and William P. Draper, Executive Committee. William B. Sleigh, Librarian. William M. Lester, Treasurer. Charles C. McElwain, 43 Federal Street, Springfield, Mass., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Stevens (Hoboken, N. J.) Photographic Society.—Established 1889. Meetings held at the Stevens Institute of Technology, on the first week in each month. Robert E. Hall, President. Joseph Cottier, Vice-President. H. S. L. Verley, Treasurer. H. H. Maxfield, Stevens Institute of Technology, Hoboken N.J., U.S.A., Secretary

St. Louis Camera Club.—Established 1885. Meetings held at 911 North Vandeventer Avenue. Walter H. Wilcox, President. J. W. Birch, Vice-President. Charles M. Alexander, Chairman of the Lantern Slide Committee. H. B. Alexander, 4028 Westminster Place, St. Louis, Mo., U.S.A., Secretary and Treasurer.

St. Paul Camera Club.—Established 1893. Meetings held at 14 East Third Street on second Tuesday in each month. James Paris, President. W. F. Brown, Vice-President. W. B. Thorne, Treasurer. W. J. Sonnen, 14 East Third Street, St. Paul, U.S.A., Secretary.

Syracuse Camera Club.—Established 1886. Incorporated 1892. Meetings held at 322 South Salina Street, Syracuse, N.Y. William. H. Olmsted, President. George Timmins, Vice-President. The Officers, and Frank E. Schnauber, Frederick Fields, George Worth, and Frederick C. Brower, Directors. John D. Pennock, Treasurer. Herbert F. Smith, 1316 Spring Street, Syracuse, N.Y., Secretary.

Tech Camera Club.—Established September, 1889. Meetings, bi-monthly, at half-past Seven p.m., in the Boynton Hall of the Polytechnic Institute. Dark room and Printing room also at Boynton Hall. The purpose of the Meetings is to discuss photographic subjects and, as far as possible, to diffuse a knowledge of the science and art among the members of the institute. The Executive Committee transact all business connected with the Club. Edward H. Keith, President. Henry N. Smith, Vice-President. Edward W. Vaill, Treasurer. Henry J. Fuller, Boynton Hall, Worcester Polytechnic Institute, Worcester, Mass. Secretary.

Technology Photographic Society.—Established 1893. Meetings are held at Rogers Building, Boston, Mass. Herman A. Poppenhusen, President. Welles M. Partridge, Vice-President. President, Vice-President, Secretary, and Treasurer, and Frederick Kleinschmidt, Committee. Arthur C. Lawley. Treasurer. E. Johnson Loring, Mass. Inst. Tech., Boston, Mass., Secretary.

Waterbury Photographic Society.—Meetings held at Brown's Block, South Main Street, on the first and third Tuesdays in each month. H. W. Hayden, President. L. S. White, Vice-President. E. W. Mooring, Treasurer. H. A. Hoadley, Box 442, Waterbury, Conn., U.S.A., Secretary.

Watertown (N. Y.) Camera Club.—Meetings held at 212 Public Square, Watertown, N.Y. A. R. Wilson, President. George Mowe, Treasurer. C. A. Wilson, 212 Public Square, Watertown, N.Y., U.S.A., Secretary.

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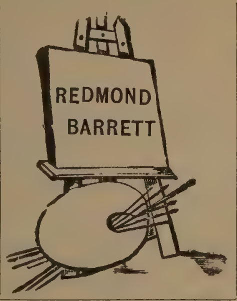

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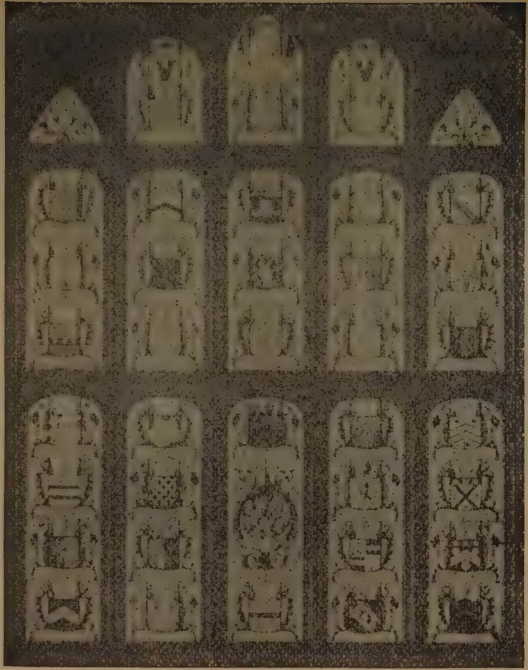

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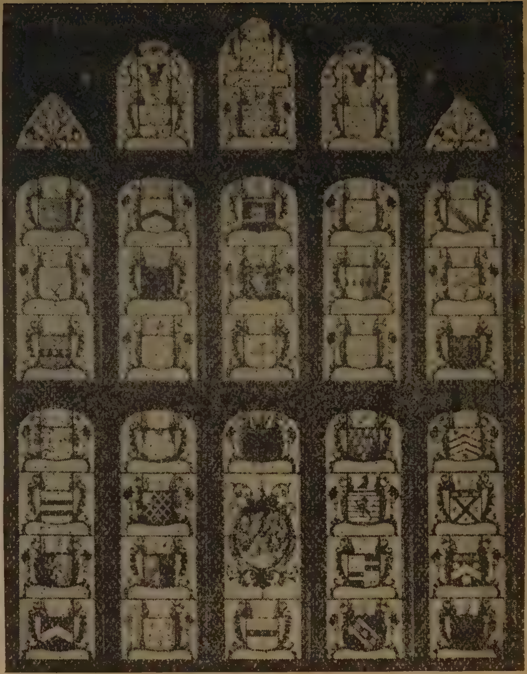

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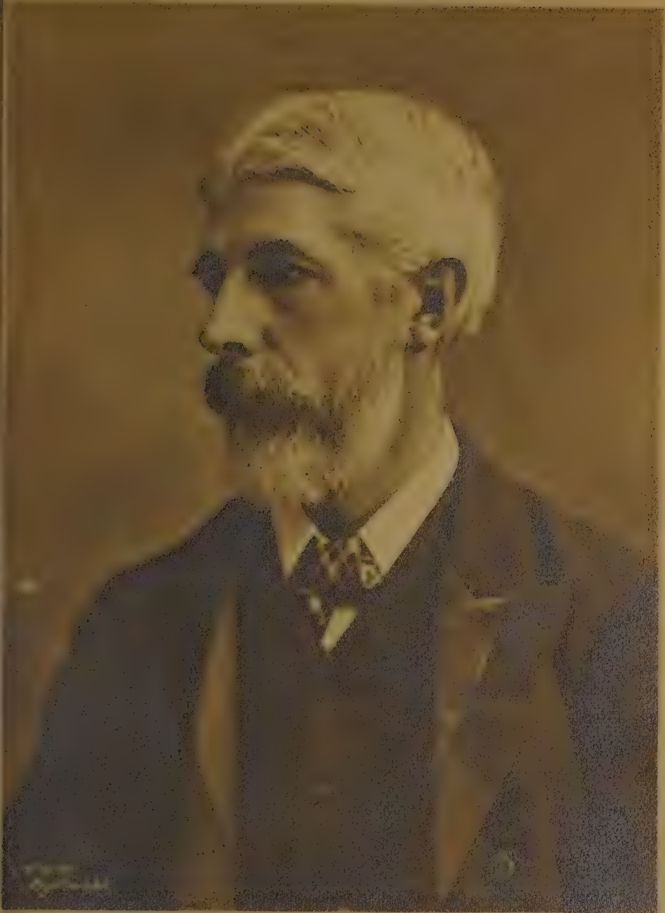

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President of The Royal Photographic Society

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SUMMARY.

This year has been somewhat fertile in the development of those special features in lenses which depend upon the utilisation of the properties of the optical glass of Jena. Opticians of Germany, Austria, England, and America now vie with each other in the production of photographic lenses of the greatest excellence, and which until the advent of the glass mentioned was impossible of being attained. This may be briefly summed up as flatness of field coupled with perfect correction for achromatism and astigmatism. Some particulars respecting the more recently introduced of these will be ascertained from the Epitome of Progress on other pages.

The recent discovery of the production of acetylene on a commercial basis can scarcely fail in forming a most powerful factor in obtaining cheap and excellent illumination when once the best conditions for burning it have been ascertained. Already several patents have been obtained for lamps in which to burn it with the requisite proportion of atmospheric air, for it is too rich to be used alone. It is too soon yet to predicate in what direction the best conditions lie, but there is little doubt that another year will have seen this nearly, if not fully, determined.

Attempts are being made to popularise collodio-chloride printing-out paper, and present appearances point to the probability of its being largely adopted. Undoubtedly collodion as a vehicle for the sensitive silver salts possesses advantages claimed on behalf of no other body.

Much attention has been devoted to half-tone work, and the theory of the shape and formation of the dot in the production of the negatives has elicited many valuable communications from Eder, Gamble, Burton, and other authorities. The process itself has been submitted to severe criticism in many quarters, a disposition being here and there evinced to revert to wood-engraving. Engraved half-tone blocks are, however, securing increased adoption, and are certainly a step in the right direction.

Continued prosperity attends the work of the Royal Photographic Society which is rapidly increasing its membership, while the Photographers' Copyright Union has proved of great service, on more than one occasion, in defending the rights of photographers against those prone to infringe their copyrights. The number of photographic societies is still on the increase.

No new advances are to be chronicled with regard to colour photography; but chromo-collotypy and allied processes are receiving marked attention in several quarters.

The meeting of the Convention held at Shrewsbury was a pronounced success; a remark also applying to the annual exhibitions of the Royal Photographic Society and the Salon. Failure, however, was the characteristic of the exhibition organized by the Imperial Institute.

The death roll includes the names of Alexander Ayton, jun. (November 23rd, 1894); R. L. Kidd (December 1st, 1894); Fritz Luckhart (Vienna); Richard Keene (December 6th, 1894); H. Fourtier (Paris); F. J. Vergara; W. W. Drinkwater (February 27th, 1895); George Smith, of the Sciopticon Company (March 19th); Wm. Ackland (March 30th); B. J. Sayce (May 23rd); M. Auty, Tynemouth (July 29th); T. G. Whaite, formerly of Carlisle (July 21st); R. Slingsby, Lincoln (August 16th); R. Urie, Glasgow; J. Duncan, York; Charles Whiting (October 6th); and Vernon Heath (October 25th). A heavy list, containing the names of many who had identified themselves with the rise and progress of modern photography.

MISCELLANEA ON THE COGNATES OF PHOTOGRAPHIC OPTICS.

By the Editor.

Responding to several requests, I have condensed, revised, and, where necessary, rewritten for this Almanac a few miscellaneous articles on the optical side of photography, contributed by me to The British Journal of Photography during the past few months, and here present them in their improved form, in the hope that they will be found useful to some, as a supplement to former writings on this topic, which, I am informed, are still accessible.

CHAPTER I.

Single Lenses for Altering the Focus of Objectives.

The principle of altering the focus of a lens by the insertion in the mount of a simple single lens, either convex or concave, has long been known and acted upon, and we have frequently commented on it; but a new application of the principle has been made by Mr. Conrad Beck, for adapting his firm's Frena, without any other focussing, to the obtaining of sharp pictures, with full aperture, at any distance ranging from three and a half feet to infinity.

Although specially made for use with the most recent Frenas, it is also applicable to every hand camera of the class known as having a fixed 'focus,' that is, those in which there is no provision made for racking the lens in or out to ensure any definite object, either near at hand or at a distance, being sharp, for, in a good hand camera, no such nonsense as fuzziness ought to be tolerated.

It is well known to all who have made a study of the subject that the addition of a simple lens of the spectacle-glass genus to an achromatic photographic objective, while altering its focus, does not, in any sensible degree, impair its power of giving sharp images at its visual focus. It is, of course, possible to overdo it by selecting an inordinately strong lens as the supplemental one, by which the achromatism of the principal objective would be quite upset; but I am alluding to a simple lens selected within the limits of moderation, and the nature of which will be seen as we proceed. For a telescopic object-glass no such addition could for an instant be permissible, the nimbus around and fringes of colour imparted to a star would soon give the reason why; but the corrections of a photographic lens are not of the same order as those of the telescopic objective, and, when not overdone, permit of a slight departure from the ordinary actinic correction without affecting the photographic result.

Let us now see in what manner these principles are applied in practice to the universalisation of the focussing of a lens. The Frena, as I have said, is a fixed-focus camera, and is so adjusted that with a five-and-a-half-inch lens of the rapid rectilinear class, working at its full aperture of *f*-8, everything beyond twenty-five feet is photographically sharp. We all know that the nearer point of sharpness could be brought very much nearer by diaphragming the lens, but the reducing of the working aperture is not now being taken into consideration, for in a hand camera rapidity must be aimed at and attained, else does a camera of this class lose much of its charm.

But we want to obtain a sharp image of something a little nearer than twenty-five feet above mentioned. The Frena system provides two means by which this can be effected. Premising that Messrs. Beck do not recommend that the lens be used at its largest possible aperture unless under very exceptional circumstances, but that a normal aperture of *f*-11 (U.S., 8)—the largest in the diaphragm plate—be employed, then, by the employment of this normal opening, the point of foreground sharpness is brought to about fifteen feet.

Still something more is supposed to be required, viz., the sharpness brought to a much nearer point without entailing further stopping down of the lens. Could the front lens of the combination be removed, and another, if only a hundredth of an inch shorter in focus, substituted for it, all would be well and the desired end obtained. But this would entail both trouble and expense. It then occurred to Mr. Beck to devise a small series of supplementary single lenses, of such predetermined foci that, by selecting any one of them and placing it in a recess in front of the camera, the focus of the whole system could be varied at will to suit the distance of the object to be photographed, and this without disturbing the primary objective.

The result of the realisation of this happy thought is a series of four thin simple lenses, each set into its cell on which are engraved its powers as regards the modification of focal range produced by its employment. Thus, No. 1 gives, with the lens at full aperture, a sharp image of all objects lying between thirty-two feet and nine feet from the front of the camera; similarly, No. 2 reduces these figures to ten and a half feet and six feet; No. 3 effects a still further reduction, the figures now representing a range from six feet to four and a half feet; while No. 4 brings the point of sharpness one foot nearer still.

Although Messrs. Beck designate these focal adapters or modifiers as Frena 'Magnifiers,' they are, we think, scarcely entitled to such designation. Taking Nos. 1 and 2 for example, an average healthy eye, on looking through them, will scarcely perceive that they have any magnifying power at all. This is particularly the case with the former of these, the radius of curvature being, Mr. Conrad Beck informs me, 180 inches, which, as these focal adapters are all plano-convex, represents a solar focus of 360 inches—practically indistinguishable from plain glass, notwithstanding which it certainly shortens the focus of the objective in the ratio I have indicated. The focus of the most powerful of the series is, very roughly measured, about forty inches. The set of four lenses are fitted into a flat, neat, morocco case, which goes easily into the waistcoat pocket. I have given this detailed description, not as in the interests of one camera in particular, but because there is an *idea* in this application of uncorrected lenses capable of being expanded if desired.

CHAPTER II.

ACHROMATIC *versus* SPECTACLE LENSES.

Soon after the advent of a new year, photographic amateurs begin to see to their appliances, so as to have them in a state of perfect readiness for use when the weather proves favourable.

Respecting one important appliance—the lens—it is altogether an error to suppose that, as I have read in a popular article in a non-photographic journal, as good a picture can be taken by means of a cheap spectacle glass as by a costly achromatic lens. Undoubtedly a picture of a sort can be obtained by such a glass, and even without it, if the front of the camera is punctured by a pinhole, and 'fuzzytypes' of this nature have even found admirers amongst some well-meaning enthusiasts of the impressionist school.

I can, however, readily conceive of young men desirous of having a practical acquaintance with photography, yet whose financial means unfortunately will not permit of their purchasing properly achromatised lenses, low-priced as some of these now are. To them the spectacle glass comes as the friend in need, and it is for the benefit of such as these this article is written.

In making purchase of a simple lens of this nature the first noticeable thing is that there is no difference in price between one of, say, six or seven inches focus, for covering a quarter-plate, and one of twenty or thirty inches focus, for plates twelve or eighteen inches. Nay, unlike achromatic lenses, those of very short focus are occasionally charged a trifle higher. The last purchase I made was one each, of the respective foci of ten, seventy-five, and one hundred inches; and there was no difference in their prices. The kind of glasses to be selected should be those known as meniscus or periscopic, and not double convex.

For ordinary landscapes one such lens only need be used, and it must be mounted convex side next the ground glass, and a diaphragm placed outside. No rule can be readily given for determining the distance between lens and diaphragm, but it may be approximately ascertained by having such a degree of separation between them as to allow of the corners of the plate being illuminated, and not much more. It will be found that to obtain a flat field a somewhat smaller stop will be required than if the lens were achromatised. In covering a 10 × 8 plate with a simple lens of sixteen inches focus, it required a stop of rather less than half an inch aperture, equalling *f*-36 approximately. Even with this, the marginal definition was visually inferior to that obtained with an achromatised lens. It would have been improved had the stop been removed to a greater distance, but this the small diameter of the spectacle glass would not admit of being done on a plate of such dimensions.

A space of half an inch was now marked off on the camera base, and the ground glass was brought nearer the lens by this distance, for, as is now well known by nearly every one, it is the actinic, and not merely the visual, rays of light by which the image is impressed on the plate, and these come to a focus about a thirtieth nearer the lens than do the more luminous rays. Now, here will be noticed some differences between the spectacle glass and the achromatic lens. Equal sharpness is theoretically impossible, for, whereas an achromatised lens brings all the rays to a focus on one plane, and thus has them concentrated at one spot, with the other, when the violet ray—the most active of the spectrum—is focussed sharply, the green, yellow, and orange rays, which all possess some, although diminished, power, are considerably out of focus, and thus surround the points of impact with faint halos. It is not now as it was long ago, or previous to the formation of our sensitive surfaces by bromine, which is much more sensitive to colour radiations than iodine.

It will perhaps be suggested that the trouble of making a special adjustment for the chemical and visual foci may be avoided by having the ground-glass frame so made as to have the focussing screen on a plane half an inch farther back than the plane against which the sensitive plate is to rest. This was actually done in early times, when achromatic lenses were less plentiful and much more costly than is now the case; but this is only effective when the focus is adjusted for objects at one definite distance. In proportion as the anterior object approaches to the lens, so, by the operation of the law of conjugate foci, does the focus of the lens become lengthened, until an object is so near that the image is the size of the original, when the focus of the quondam sixteen-inch lens becomes thirty-two inches, causing now a difference of over an inch, instead of half an inch, between visual and chemical foci.

Without indulging in further reasoning on this subject, I advise that the photographic employment of spectacle glasses as lenses be confined to cameras of small dimensions and of short focus, that the ground glass be entirely eliminated, and that the focussing be done by means of scales of distances determined by previous actual trial. In this way only can such lenses be utilised without causing more or less trouble to the users.

Two simple lenses may be mounted together in the manner of a rapid, or even a slow, rectilinear. The advantage of mounting them in this way will be found in their producing architectural or similar photographs in which there will be absolutely no curvilinear distortion.

CHAPTER III.

Large Apertures for Landscape Lenses.

A large aperture in a landscape lens confers the advantage of reducing the time of exposure; but, in the case of a lens of even moderately long focus, such is of comparatively little use, for, if distant objects are rendered sharp, nearer ones are 'nowhere' as regards definition, and *vice versâ.* I am not now specially referring to any one form of lens in particular, but to every class of lens that can be employed in the production of landscapes.

Absolute flatness of field cannot with the vast majority of lenses be obtained when they are used with a large aperture, such as that assumed in the preceding paragraph, although I am aware of this property existing concurrently with other good features in certain lenses of German inception.

When our English, or even foreign-made, cemented lenses of the so-called 'rapid' type of long focus are stopped down to a degree sufficient to secure sharpness of objects ranging from foreground to distance, then is the requisite flattening of the field simultaneously obtained, and then is the original 'Steinheil,' or 'rapid rectilinear,' able to compete with all comers. Not that I would seek to detract from lenses having absolute flatness with the largest of apertures, Phœbus forbid! for I look upon such as optical triumphs, and appreciate them accordingly; but the fact is that, in order to secure a lengthening outwards of definition, even the most perfect instrument, optically considered, must be employed with a more or less reduced aperture, which brings it nearly on a par with those in every-day use. I reiterate the statement that this has mainly reference to the delineation of landscapes by lenses of long focus—say, twelve inches or upwards. The optical reasons for this have elsewhere already been sufficiently discussed, hence they need not be alluded to again further than to say that they are referable to the law of conjugate focus. Hence, the longer is the focus of any lens the more in proportion must it be stopped down in order to bring even to moderate uniform sharpness scenes situated at a distance from each other.

As the foci of lenses shorten, so is the depth of defining power increased, and with those of five or six inches focus, working, say, at from *f*-8 to *f*-11, there is but little need for the employment of a diaphragm, so far as concerns the bringing into harmonious sharpness objects beyond a few yards' distance from the camera. It is in lenses of this class that the advantage of *absolute* flatness of field will be most apparent, especially for hand cameras, in which great rapidity of action is needed. What is here desired is largeness of aperture, conjoined with the flattest obtainable field. It is only by the most recently introduced lenses that this desideratum has hitherto been obtained.

But the good old lenses, which have rendered so much good service during the past two or more decades, in which the glass of more than a quarter of a century finds a place, will continue to live on, despite the theoretical beauty of modern rivals.

Reverting to the discriminating of planes at various distances, by large lenses of long focus on the one hand and small short-focussed objectives on the other, I have had trials made of both the smallest and the longest one in my possession, the focus of which is eighty-eight inches, with an aperture of nearly five inches. As it gives absolute sharpness of the axial rays, it affords facilities for a practical study of conjugate focus as applied to landscapes. Within a distance of something over a mile it has no 'depth of focus' whatever. I need scarcely say that it is of very limited use in landscape photography, for which purpose, however, it was not made, for, when focussed sharply on a prominent building at the distance of a half mile, objects about a hundred yards nearer are found to be sensibly out of sharp focus when examined by a small Ramsden eyepiece. And this discrepancy is found to exist even when the objective is stopped down to one-half of its area; but, with the smaller lens of short focus, when even worked with a comparatively much larger aperture, the depth is so great that there is no appreciable difference in the sharpness of an object only seven feet away and that of the building to which allusion has just been made.

CHAPTER IV.

NATURALISTIC FOCUSSING.

'What *is* naturalistic focussing?' let us imagine to have been asked —as, indeed, it has been, and that repeatedly. It consists, roughly speaking, in focussing upon the principal object in the scene being photographed, allowing all others to be subordinate as regards sharpness. 'The principal object in the picture,' says Dr. Emerson, 'must be fairly sharp—just as sharp as the eye' (whose, and what kind of eye?) 'sees it, and no sharper; but everything else, and all other planes of the picture, must be subdued, so that the resulting print shall give an impression to the eye as nearly identical as possible to the impression given by the natural scene.' This constitutes, in the main, the teachings of Dr. Emerson as founder of the new school. But here it must be observed that, so far from being a new doctrine, it is the very oldest teaching of the art section of the founders of the now Royal Photographic Society, who, like our modern art teachers, declaimed, and properly so, against the idea of placing every unimportant bit of scenery in sharp focus.

In the very first paper that was read before this Society, in February, 1853, the Vice-President, Sir William J. Newton, said that he did not conceive it to be necessary or desirable for an artist to represent or aim at the attainment of every minute detail, but to endeavour at producing a broad and general effect, by which means the suggestions which nature offers, as represented by the camera, would assist his studies materially; and for that purpose he did not consider it necessary that the whole of the subject should be in focus; on the contrary, he had found in many instances that the object is better obtained by the whole subject being a little out of focus, thereby giving a greater breadth of effect, and consequently more suggestive of the true character of nature. He wished, however, to be understood as applying these observations to artists only, such productions being considered merely as private *studies* to assist them in their compositions.

During the same year other artists (painters) homologated the sentiments of Sir W. Newton. Among others, Mr. John Leighton discussed the question as to the extent to which absolute accuracy of definition is to be insisted on in photographic pictures. He placed the argument on the footing of an inquiry into the boundaries separating art from nature, the former being defined as something founded upon, and bearing some resemblance to, the latter. Fine art sought to elevate the imagination by lofty images derived from nature in her most agreeable form Nature might be, and was, much conventionalised in the noblest and highest art; the abstract was given without the minutiæ. In photography this was reversed, breadth being sacrificed to detail. For purposes of science, for natural history, architecture, or engineering, the utmost detail attainable was advantageous; but the artist would not descend to minutiæ, he desired breadth of effect. He complained that photographs were too literal to compete with works of art; they contained near and distant objects upon the same plane, backgrounds and foregrounds of equal intensity, things known to painters to be incompatible with nature as viewed with the two eyes. Minute detail was the attribute of the sun picture, but not so of the work of art; consequently, many photographs might be cut up into several pieces, all beautiful, but no particle could be removed from a work of art without detriment, since it possessed unity.

Still another artist in those early days, Mr. R. W. Buss, propounded sentiments similar to those just given. No slavish imitation of nature, or he was no longer an artist. Some experience in photography, and a life spent in pursuit of art, convinced him, as it would all artists, that good definition would be injurious to the obtaining natural studies of breadth of effect to guide the painter in the conduct of his light and shade in his picture, and so forth. Now, we wonder how much of the denunciation of detail in 'works of fine art,' so freely indulged in by painters, is owing to the fact that a feeling of jealousy of the camera underlies it. Artists could not afford to spend so much of their time as would be requisite if they attempted even a fourth of the detail in a photograph.

Again, has it never occurred to them that, if they rack the lens in or out to impart breadth to their principal theme or plane in the photograph, by throwing that a little out of focus, they only sharpen some unimportant part by the infallible law of conjugate focus, thus rendering it more intrusive than it would otherwise have been?

It was the appreciation of this difficulty that led Mr. Fox Talbot to recommend those who desired softness of outline in their prints to insert a sheet of plain paper between the negative and the sensitised paper while printing, and that afterwards led to my devising, in 1863, the first diffusion of focus lens concerning which, when exhibited at a meeting of the Photographic Society of Scotland, it was stated that, in its ordinary condition, it gave great sharpness, but that upon moving a button in a slot, by which the relative positions of the lenses were altered, it gave a picture generally sharp all over, but particularly sharp nowhere. Special attention was directed to the advisability of securing a lowered degree of sharpness in this way, rather than by the common method of putting the subject a little out of focus.

Dr. Emerson's plan of focussing the principal object, and keeping the remainder of the picture in subordination, is precisely what every one worthy the name of a photographer has ever done, be he portraitist or landscapist. But I am doubtful of the possibility of doing this effectively with the lenses he employs, unless the principal object to be focussed stands somewhat far apart from other objects; and, on examining some of his pictures, I find no evidences of the chief object being differentiated in sharpness as compared with other objects at varying distances. But, be this as it may, the Council of the Royal Photographic Society, in awarding him the progress medal, have shown their appreciation of Dr. Emerson's earnest and forcible pleas for the infusion of art principles into photography, even although, as I have shown, this topic largely engrossed the attention of leading photographers so long ago as 1853.

CHAPTER V.

Dissolving Views by the Stereoscope.

The effectiveness of dissolving views is well recognised. They have hitherto been confined to the exhibition of pictures by the lantern, but such are tame compared with the dissolving of one stereoscopic view into another.

Stereoscopic dissolving views are very rarely, if ever, now come across unless it may be in the collection of a few of the *cognoscenti*, and these rather on the Continent than in this country. They had just been introduced, and were beginning to be appreciated, when the cloud descended in which the whole system of stereoscopiscity was enshrouded, although only for a time, as we now know. The solidity of an image in the stereoscope conduces to the superiority of the effect when a pair of flat pictures are made to dissolve one into the other in the optical lantern. In the case of interiors, we see chairs and tables getting gloriously mixed. Some one article of furniture will be seen to slowly plant itself in front of some other article; pictures on the wall become at first hazy, and are then found to be fast being supplanted by others; Ariadne and her tiger are being deposed by Una and the lion, and Hercules fades into nothingness as Cæsar advances. All this must be seen to be adequately appreciated. And besides—and in this lies a strong point of vantage—all this may be seen at one's own fireside, free from the trouble and fuss of having to unlimber and fit up a pair of lanterns by which to have them projected on a screen.

A dissolving stereoscope may be fitted up so as to form an elegant addition to the *bric-à-brac* on the parlour table or drawing-room window, and, when constructed as a thing of beauty, it will emphatically prove a joy for ever.

To aid in their coming, I will now give an account of the principles involved in their construction, and in doing so will assume that the slides are printed as glass transparencies.

Speaking in general terms, the principle of the dissolving stereoscope is this: A slide is placed behind, in a closed stereoscope, and in the usual position for examination, and a second slide is placed above or below, the top being cut open. While the slide at the back is being examined, a silvered reflector, standing at an angle of forty-five degrees, between the eyepieces and the picture, is slowly lowered or raised until it cuts off the direct view, and shows only the slide which lies on the top of the instrument.

This is the general principle, but departures may have been made in working out details. For example, I have mentioned a silvered reflector for effecting the change in the direction of the rays; but I have known of the reflector not being silvered at all, but consisting merely of a small sheet of plain patent plate glass, the surface of which, standing at the slope it does, reflects sufficient light to enable the second picture to be seen with sufficient distinctness and under conditions of sufficient luminousness. When a stereoscope is made with a simple reflector of this nature, very little work indeed is entailed in its construction. The whole work of dissolving is then effected by a pair of flap shutters outside of each picture, by which the light is cut off, and thus cannot enter the stereoscope. Upon making a trial of this plain glass reflector, I find that, when all light from behind is debarred access, and the inside of the stereoscope well blackened, its reflecting power is very considerable, and quite enough to show the upper picture with a fair degree of brilliance. It possesses this further advantage, that, when the light from the upper picture is shut out, the direct picture behind is seen with quite as much seeming brilliance as if the sheet of plain glass were not interposed between the eye and the slide.

The act of dissolving with a fixed plain glass reflector such as described consists in having the respective flap shutters which cover the transparencies on the outside geared together by a metallic strap or rod, so that, when one stands quite open, the other is entirely shut, and *vice versâ.* By the same movement which opens the one the other is closed. The mechanism involved in this is far simpler than might appear from reading this description, and is not for a moment to be compared with the far greater drain on one's mechanical skill involved in the construction of even the simplest of our modern hand cameras or shutters.

But the refinement of this system consists in having the reflector composed of platinised glass—that is, glass which has had a very thin coating of platinum given to one side and then vitrified. Previous to vitrification, the platinic deposit should be thinned away at one margin so as to merge gradually into clear glass. By this means, and by a slight movement of the reflector up and down, the acme of perfection in the reflecting portion of the screen may be had in the one portion, and perfect transparence in the other.

CHAPTER VI.

PHOTOGRAPHERS AS DRAUGHTSMEN : THE CAMERA OBSCURA.

Photographers who wish to be considered artists in the broadest sense, and some of whom arrogate to themselves the title, should bestow a little of their leisure time in acquiring at least the elements of free-hand drawing. The ability to draw as well as to photograph confers an intense pleasure to the one who is able to do both. We all know that artists, as well as poets, are born, not made ; but it is quite possible for any one, not actually a noodle, to acquire at least a modicum of artistic knowledge, such an amount, at any rate, as will enable him to make a sketchy semblance of any scene before him.

It is on record that those past masters of our science—Daguerre and H. Fox Talbot—used to prowl around fine scenery, making sketches thereof by means of the camera obscura, the camera lucida, and, failing these, by the unaided pencil. These, as we all know, led to their desiring to obtain the fullest details of such subjects by chemical means, in which they ultimately succeeded, and thus was photography, as it now exists, initiated.

The camera obscura has many different forms, according to the purpose for which it is to be employed. Although the celebrated Baptista Porta has been said to have been its inventor, there is some reason for believing that it was known before his time. The photographic camera is, in a strict sense, a camera obscura (dark chamber), but not in the sense in which the term is now employed, which may be said to be the visual examination of external objects depicted on a white table as in life. Almost every reader will have seen the instrument on a large scale in popular observatories or at the seaside resorts. It here assumes the form of a large lens of long focus at the top of an erection to which no light is admitted save that which passes through the lens, the image thus formed being projected downwards upon a flatted white table, around which the spectators sit.

Those little finders with which so many hand cameras are now fitted are also cameræ obscuræ, but are of no use as drawing cameras, any more than are the much larger ones of the fancy bazaars or toyshops. They all show nature as it is, in its forms, colours, and all ; but everything is reversed as regards right and left, and consequently are useless for the purpose which we are now advocating, viz., projecting a scene on a flat tablet capable of being traced in outline by the pencil.

That artists do not—or, at any rate, *did* not in former times—disdain to make use of the drawing camera obscura is evinced by the numerous and ingenious portable contrivances brought into the field some years since, and, for all we know, may still be so ; only I have an idea that photography has had an influence in revolutionising this.

A good portable instrument of this nature may be made to serve many useful ends in addition to giving a good ' copy ' for the budding artist who is learning to draw. But the first thing one should do is to acquire the art of interpreting nature when depicted on his tablet, with a few free-hand touches of a pencil, so as to leave no doubt as to which tree of a series is an oak, an ash, an elm, or a weeping willow. This is an art that can be readily acquired by the study of any of the numerous handbooks on drawing from nature, sold by artists' colourmen usually for a shilling. Education of this elementary nature having been obtained, the aid of the camera obscura may then be invoked.

A missionary friend was about to go to some place on the Zambesi, and was desirous of educating himself before starting as to the best means of enabling himself to send home views which should enable him to depict the scenes among which he should be located with a fair degree of accuracy. Photography was out of the question at that time, and he could not draw. The advice I gave savoured of what has just been written, and I designed for him a very portable camera obscura, which, when folded up, could easily be carried in his coat pocket, all but a stand on which it was to be erected. Its principle was this, and I commend it to photographers who wish to learn how to make pencil sketches without the aid of photography: A lens, of about fifteen inches focus, is mounted at the head of a pyramidally mounted opaque black cloth, erected on a stand, having at one side an aperture, through which is inserted the right hand with a pencil, on the base being spread out a sheet of paper, and in the rear of the cover cloth an aperture through which the face of the observer can be directed downwards, so as to see the image formed by the lens, outside of which is a small mirror, placed at an angle of forty-five degrees, so that external nature is thrown down and sharply focussed upon the paper below. It is not of vital consequence that the dark covering cloth be absolutely light-tight, as it would be were the operation a purely photographic one, for it requires a very considerable leakage of light to obliterate or render unduly dim the image formed by the lens, which, by the way, and for this purpose, need not necessarily be an achromatic one, worked with a small diaphragm. It may be here stated that, through the humble instrument described, the friend spoken of ultimately became a fairly expert draughtsman, even without its aid.

CHAPTER VII.

Combining Badly Mounted Stereoscopic Pictures.

It is sometimes the case that, when one examines a binocular picture in the stereoscope, he or she complains of a straining pain in the eyes, arising from the attempt to get the pictures to combine.

This is invariably caused by the mounting of the two elementary parts of the completed slide too far apart. In a properly adjusted stereoscope, scarcely one in a thousand can bring into coalescence a pair of pictures which are mounted three and a half inches apart, measuring from the centres of each, and the attempt to do so is usually attended by the pain alluded to. No really wise stereographer now thinks of mounting his pictures much above two and three-quarter inches apart, for, when this distance is not exceeded, they are brought into union without any straining to effect their combining.

It is possible, however, to combine the pictures when they are so far apart as to exceed very considerably the proper amount of separation. This is done by having the eyepieces of the stereoscope mounted in such a manner that they can be drawn apart from each other to a greater distance than when they are adjusted for a properly mounted picture. This was adopted in all the stereoscopes made according to Sir David Brewster's directions when he first introduced this instrument. His lenses were each mounted on a small square of wood which moved laterally in a rebate in front of the stereoscope so as to permit of adjustment to the width of the eyes of the observer. Now, in proportion to the separation of the eyepieces, so is it possible to combine pictures which are mounted too wide apart, however undesirable it may be that the necessity for doing so exists.

The mechanical appliances which have been called into requisition since the introduction of the Brewster stereoscope for effecting the separation of the eyepieces have been varied. These comprise, *inter alia*, the double-rack movement, which is not the best for this purpose, on account of the actuating pinion coming nearly between the eyes of the observer; the right and left-threaded screw, the milled head of which projects at one side of the front, and is thus easily operated; the oblique lever, one end of which depends from the centre between the lenses, and a touch of which to one side or the other gives opposing motions to the lenses; and, finally, geared lenses as in the Lothian stereoscope, a description of which will be found in another part of this ALMANAC.

With a stereoscope having adjustable lenses of either of the methods mentioned, there are scarcely any pictures so badly and widely mounted but what they can be brought into coalescence. The way to do this is to have the eyepieces first at their usual distance apart, and then, looking at the pictures, which will in all probability present a jumbled-up appearance, increase the separation of the eyepieces to the greatest possible extent, if required, until the axes of the eyes are near to the inner margins of the lenses or prisms. Now, when coalescence takes place, and the eyes have well grasped the details, lessen the distance between the two eyepieces, which can then be done without disturbing the definition already obtained. In this way may a binocular picture be seen and examined which, under no circumstances, could be so by the ordinary fixed lenses stereoscope.

But the necessity for having to do all this will be avoided by refraining from mounting the halves of the picture more than two inches and a half, or two inches and five-eighths apart. With a slide thus mounted, pain in the eyes of the observer will be altogether unknown, and the picture will come to the eyes as naturally and expeditiously as will any scene in nature when looked at.

CHAPTER VIII.

Foregrounds with Lenses of Flat Field.

Since writing on a cognate topic (Chapter III.), I have heard a theoretical objection urged against those lenses of Continental make in which the field is flat. If this absolute flatness exist, what, it is asked, becomes of the foreground of the landscape made by such a lens? This implied objection, it is evident, could only be made by those whose experience in the use of a variety of objectives has stopped short at including in the curriculum those corrected by the use of the new glass now being made in Jena—the one town in the world in which glass, possessing those special characteristics which distinguish the manufactures of that place, is systematically made.

Truly does the mental action of these 'antediluvians' of our own period form a subject for careful and interesting study. On the one hand, we have intelligent, skilful opticians straining every nerve, as it were, to give us lenses which are as near theoretical and practical perfection as can reasonably be desired, and, on the other hand, photographers of the carping school, who, now that their aspirations have been realised, profess to decry, and for a fancied—not a real—objection, that for which they have so long craved. It is prejudice begotten of ignorance. I will endeavour to show on what a sandy foundation their structure is erected.

Now, then, for this sharpness of foreground that is to be no more attainable, on account of the superior flatness of the field given by the new lenses. In the former article, already referred to, I said that penetration or, in other words, depth of focus or of definition did not depend upon the nature of the lens, but upon the stopping of it down to a sufficient extent, and that, in the case of one which with full aperture would not carry its central sharpness to the margin, a lens of rather long focus being presupposed, the mere act of making use of a stop in order to obtain the requisite depth would simultaneously ensure both this property and the marginal sharpening. I am not now speaking of any theoretical matter, but one of fact, and known to every intelligent user of a lens.

more it is stopped down, the nearer to the point of sight does the foreground become sharp. The theoretical focus remains where it was, that is, if the lens is aplanatic; but the practical sharpening of objects much nearer than that focus is increased, and it is this practical advantage with which photographers have to do.

I have proved by actual experiment that, no matter what the focus of the lens may be, foreground objects, much too close to the camera to be tolerated in a picture with any artistic pretensions, may be rendered with the greatest conceivable sharpness if, bearing in mind the law of conjugate focus, the simple expedient be resorted to of swinging the top of the ground glass a little backwards. This, when the horizon of the view is near to the middle of the picture image, permits of a photograph uniformly sharp all over being obtained, even when the lens is employed with its full aperture. The foreground objects, being nearer to the camera than the distance, have their conjugate foci increasingly farther from the lens, and the swinging backwards of the upper portion of the ground-glass focussing screen fulfils the requirement of conjugate focus in a very perfect manner. It does this with any kind of lens, but with the new lenses of Jena glass (which we here assume to have an absolutely flat field) it does so in a much more perfect manner than with the others. The marginal astigmatism being annihilated, the foreground definition is necessarily far more perfect than could be secured by any lens in which any astigmatism was left uncorrected, and this too with a much larger aperture than with others, for the round or, more accurately, the hollow field of these others demands their being stopped well down in order to make the horizontal plane quite sharp, the sides as well as the centre. The advantage gained by the use of the more perfect objective is twofold, greater critical sharpness of the foreground objects and the attainment of this with a large aperture.

All this might have readily been deduced from theoretical considerations; but, having an anastigmat for the purpose of experiment, I have subjected it to a trial of the following nature: It was focussed on a row of brick houses a few hundred yards away. This represented the distance. The foreground was prepared for the experiment by placing a row of low-potted plants on the ground, about four yards from the camera. The lens was used with its full aperture. In the negative which resulted both the brick houses and the foreground shrubs were sharp in an exceeding degree, the latter bearing examination by a magnifying glass of great power. The trial was repeated, this time with a lens of similar focus, but of the ordinary time-honoured class. In this case the negative obtained was inferior to the other, and not until a small diaphragm had been inserted into the lens could the definition of the foreground shrubs be rendered as evenly from side to side of the plate as with the other.

From what has been said it will be seen that there is nothing to prevent a sharp and even near foreground from being taken with one of the new lenses of Jena glass and corrected for an absolutely flat field.

CHAPTER IX.

Crucial Focussing by Eyepieces.

Some of the advantages which exist in the use of the new large aperture lenses, now so readily procurable, are sacrificed by the inefficiency too often displayed in focussing, thus not getting out of the lens all the sharpness capable of being attained. One may say that he invariably employs a magnifying glass to ensure the sharpest possible image on the screen. This is certainly better than trusting to the unaided eye.

The best form of positive focussing glass, or eyepiece, is that known as the Ramsden eyepiece, which, as every reader probably knows, is composed of two plano-convex lenses, plane sides out, and separated from each other to the extent of a little less than the focus of one of them. The last one I had made for use as a focussing eyepiece had the following measurements:—

The lens nearest the eye is one and a half inch focus, and five-eighths in diameter. The one farthest from the eye is one inch in focus, and one and a quarter inch in diameter. When mounted in the tube, their plain surfaces are one and a quarter inch apart. They are set in a tube, their plain surfaces to the outside, and this tube slides in a jacket, furnished with a clamping-screw collar so as to fix it all rigid, when once the adjustment has been made by pressing the end of the jacket against the plain side of the focussing screen, and focussing its ground surface. This adjustment serves once for all for that particular ground glass.

If for any special purpose, or to ensure still greater accuracy in focussing, a still higher power is desired, this is easy of attainment by selecting glasses of shorter focus, preserving as nearly as possible the same proportions as we have given above, and which are those found in several treatises on eyepieces. It is, however, not expedient that too great magnifying power be employed for a focussing eyepiece of this description, because a high power presupposes a tube too short for enabling the face of the observer to be brought into proximity to the screen.

This difficulty is obviated, and a better result obtained, by employing a compound microscope of what a microscopist would call low power. It should not have a stand, but should consist only of a straight piece of tubing; and, whereas with all other eyepieces the focussing screen ought to have a grey or roughened surface by which to arrest the rays, with a microscopic focusser it will be found more advantageous that it be of plain glass.

But I pause for a moment to speak of the inadequacy of even our best commercial ground glass to render justice to the highest class of critical focussing. I have found glass prepared in the following manner greatly superior, although I would hesitate to assert that it is the best: Obtain a sheet of polished glass that is quite flat, and, having made it scrupulously clean, hold its best polished side a few inches over a flat guttapercha or vulcanite tray, on the bottom of which has been sprinkled a little crushed fluor spar, which, in turn, is sprinkled with some sulphuric acid. This gives off fumes which will immediately act upon the glass exposed to them. Judgment is required as to the extent the corrosion is allowed to proceed. This gives a dull surface, of which the grain is finer than that of any glass ground by means of emery, and on which a sharp focus may be obtained with the aid of a high-power Ramsden eyepiece.

The microscope I recommend for the sharpest focussing possible to be obtained has an objective formed of two, or sometimes three, plano-convex achromatic lenses of the *largest* size supplied of the foreign French microscopic class, procurable at any of the dealers in cheap optical goods. They are usually screwed together, and are sold as French triplet inches, this being the combined power of the three, although they often vary in respect of real power. These are set in one end of a tube, and a strong Huyghenian eyepiece in the other end. The longer the tube the greater is the power, but for our present purpose five or six inches will suffice.

What is of importance is to have a sliding adjustable jacket on the objective end of the tube, so as to permit of the tube that contains the lenses being withdrawn so far back, when the jacket is pressed against the back of the focussing screen, as to show with the utmost distinctness any markings on the face of the screen. Delicate scratches suffice as markings, so does a small sprinkling of starch flour or anything that adheres to the surface of the screen, which ought to be plain glass in the sense of its not having been roughened by being ground. When once the focussing of such objects has been attained, the jacket should be tightened and never afterwards altered.

I recommend for rough focussing and composition of the picture a screen ground to the margins, with a portion left, polished in the centre, against which this microscopic focusser may be placed. The best way to make such a screen is to varnish a small space in the centre of the glass plate, of which I have spoken when describing the dulling of the surface by the fumes of hydrofluoric acid, afterwards removing the varnish by alcohol when the etching has been completed. I have, however, seen a useful screen made by cementing, by Canada balsam, a thin microscopic slide cover glass on the surface of the ordinary ground-glass focussing screen

CHAPTER X.

Flattening the Field of Lantern Pictures.

The most noticeable fault to be found with lantern pictures seen projected on the screens at eight-tenths of the miscellaneous Exhibitions, private and public, is the want of sharpness at the margins of the disc.

It is only a few years since the great importance of ameliorating this evil engaged the attention of the practical optician, and the good effect of this is seen when a lantern is fitted with a lens well corrected for flatness. But the great majority of objectives in use in the household lantern are of the French portrait class, and these, with very few exceptions, while giving good enough definition on the centre of the disc, give an image painfully indistinct as it approaches the margin, while, when by focussing so as to get marginal sharpness, the centre then becomes as indistinct as the sides previously were.

It was a similar condition of things to this when, as applied to the taking of a negative quarter-plate size, any attempt to do so by a rapid portrait lens worked without any diaphragm was made, that led the then Astronomer Royal for Scotland, Prof. Piazzi Smyth, to formulate means by which this could be avoided.

His idea was to so lengthen the oblique pencils of a lens having a round field as to eventually render the whole field flat, and the corrector he employed for this purpose consisted of a rather thick plate of glass the size of the sensitive plate, one side, that towards the front, being ground to a hollow or concave curve, the other side being flat. This was mounted in front of and as close to the sensitive plate as possible.

The action of this corrector is as follows:—The axial rays from the lens fall upon its centre where it is very thin, and, although the convergence is affected, it is only so in a slight degree, and the rays come to a focus upon the plane of representation. But at the margin the rays have to pass through a considerable body of glass, which they do in a degree more nearly approaching parallelism than previous to their entrance, and, upon emerging from the flat surface, they have still to travel a little further before being brought to a focus on the sensitive plate. As the curved surface of this corrector stands so nearly normal to the rays, there is scarcely any loss from oblique incidence, while there is a very decided gain in rapidity in consequence of the large aperture that can be given to the lens.

This corrector was introduced in the days when wet collodion was the most sensitive surface that was obtainable, and when every conceivable expedient had to be resorted to in order to obtain instantaneous pictures; but, since the advent of gelatine dry plates, a high degree of instantaneity may be obtained with lenses working with a much smaller aperture than formerly, and hence, for the purpose originally intended, the corrector fell into disuse.

But it has been resuscitated this time for a different, although equally useful, purpose. It occured to Messrs. Swift & Son, that in the now discarded corrector was to be found the very thing that, with these round-field lantern objectives of which we have spoken, would flatten the field of delineation, and thus give a disc covered sharply to the edge. This firm accordingly subjected the idea to practice, and finds that it quite fulfils their anticipations.

Their lantern corrector is a square plano-concave lens, measuring about an eighth of an inch larger than the standard size of a transparency. This square lens or corrector is made of colourless glass, and is highly polished. It is fixed upon or let into the wooden slide adapter in front of the orifice through which the picture is shown, and, of course, the flat side as near as convenient to the slide, which must not, however, be allowed to touch it.

It has a negative focus of about thirty-five inches, and, as its thickness at the corners is only a quarter of an inch, it wlll be seen that it does not add much to the thickness of the adapter.

CHAPTER XI.

A Historical Note on Triple Lenses.

By a triple lens, in the sense now to be spoken of, is meant two positive lenses separated at some distance apart, with a negative lens between them.

The first triple lens of which I have any knowledge is that of Frederick Scott Archer, the inventor of the collodion process. Archer was a good chemist and a good optician, and devised at least one entirely new lens—a doublet which worked at full aperture—altogether different from the Petzval combination. To this last-named lens he, in 1853, had adapted a simple concave lens, which was fitted in a body of the tube where the diaphragm would be inserted. By this addition the focus was lengthened, and a larger picture capable of being made, with freedom from distortion.

As regards triple compounds, here the matter rested until, in 1858, Mr. George Shadbolt suggested the practicability of producing 'a useful landscape combination by means of a couple of single convex lenses at each end of a short tube, corrected by a smaller concave of flint glass in a central diaphragm.'

The seed thus cast into the ground soon began to germinate. First of all came Thomas Sutton, who suggested that, instead of single positive lenses at each end of the tube, they should consist of achromatic ones of the usual landscape lens form. Perfect symmetry in every respect was insisted upon in order to secure absolute freedom from distortion, the negative power of the central concave being equal to the positive power of either of the others.

Some people are inclined to give Sutton all the credit of inventing the triple compound, but to this he is not entitled. He is, however, entitled to the credit of having kept the lens for a considerable time before the public through the agency of the *Journal of the Photographic Society* and his own "Notes." He also brought it to the notice of the British Association. The lens was first introduced in February 1859. The centre negative lens, he suggested, should be constructed of rock crystal, having surfaces of equal radii, and of nearly equal focus to the front lens, so that the focus of the whole combination was the same as that of the back lens alone. Sutton at first insisted upon absolute mechanical symmetry in the lens as one of the conditions under which perfect freedom from distortion was alone obtainable.

Not so, however, thought Goddard, a working optician of that period, and of a very original and inventive turn of mind. About that time (1860) the Photographic Society of Scotland had appointed a committee to procure, examine, and report upon the characteristics of various new lenses that had recently been introduced, and, amongst others, sent by Grubb, Ross, Voigtlander, Goddard, and others was one by the last-named optician, of a form differing from any of the others. Upon dissection, I found that, while there was a seeming similarity to Sutton's triplet, it differed in detail of construction.

The points of similarity were that the front and back elements of the combination were of similar foci, and that the negative power of the central lens equalled either. The dissimilar points were a total departure from the mechanical symmetry so strongly insisted upon by Sutton; the front lens was a nearly flat achromatic, the flatter surface being slightly concave, while the back lens was a very deep, simple meniscus—that is, it was formed of one piece of crown glass only. The centre concave was not literally centrally placed, but was set much nearer to the front than to the back lens. It was double concave, but of unequal curves, the shallower curvature being towards the front. It was formed of light flint. The tube in which these lenses were mounted being short, a very wide angle of view was included, and there was absolutely no distortion. Goddard died just afterwards, and hence were terminated investigations of a most interesting nature.

The triplet achromatic of J. H. Dallmeyer followed next. It was introduced in 1860. While possessing some similarity to the others just spoken of, it differed from them in detail. First, all the three lenses were achromatic *per se*. The front and back differed in a slight measure in foci, the front being rather the smaller and more powerful of the two, while the centre concave was, negatively, of about the same power as the back lens. All three were slightly meniscus, the flatter side of the negative lens being towards the front lens, from which it was separated by but a short space. Modifications were introduced by other makers, the only readily discoverable one consisted in making all the flatter surfaces quite flat, instead of with the curved surfaces preferred by Dallmeyer. This optician subsequently (in 1866) applied for two patents for triple lenses, in which all three elements were of the simple or single form, the burden of achromatising the two outside positive lenses being thrown upon the central one of flint, in accordance with the suggestion of Mr. Shadbolt made eight years previously. Both of these patents were allowed to lapse before coming to maturity.

Soon after the historic events narrated, the Steinheil and rapid rectilinear lenses were introduced, and the triple lenses being supplanted fell into disuetude.

The possibilities of this oft-introduced and much-modified triple lens have recently been investigated by an optician whose great mathematical and optical qualifications are universally admitted — Mr. H. Dennis Taylor, the optical manager of the works of the firm of T. Cooke & Sons, York.

An account of Dennis Taylor's lens will be found in the Epitome in the present ALMANAC.

CHAPTER XII.

OPTICAL AIDS TO FOCUSSING AND RETOUCHING.

It is not to everyone that is given the power of focussing with the extreme of sharpness without the aid of some one or other of the numerous magnifiers now supplied by enterprising dealers in photographic apparatus.

Amongst other aids to vision for this purpose, I have long advocated and employed the simple watchmaker's eyeglass, set in a light horn mounting; and this primarily for the reason that, after a little practice, it can be held firmly by the muscles surrounding the eye, permitting the release of both hands, which can be relegated to other work.

Some time ago, when out photographing with a friend who was somewhat short-sighted, I noted and rather admired the ease and accuracy with which he effected the delicate operation of bringing his object into sharp focus with his unaided vision, his eyes being brought to within about five inches or so from the ground glass of the camera, and this led to the instituting of a comparison between his method and mine, to the disadvantage of the latter. If any one applies to the optician for a pair of five-inch focus spectacles, as I lost no time in doing on the occasion referred to, he may find an impossibility of seeing sharply one and the same object with both eyes. The object—in this case the image on the focussing screen of the camera—is seen distinctly with either eye, but seldom with both simultaneously. This, at first sight, would render strongly magnifying spectacles useless in a large measure for our present object, which is to make use of *both* eyes; but a little optical reasoning will speedily show the cause, and indicate the complete cure for this.

In looking through glasses of medium strength, the eyes, if healthy, possess the power of adjusting their axes so as to converge to a considerable degree; but, when those of very great power, such as are suitable for extremely aged persons, are employed, such glasses being supposed to be of short focus, say, from four to six or seven inches, the eyes have not powers of convergence sufficient to meet the greater demands made upon them. To remedy this, the glasses must be decentered—that is to say, the centres of the lenses must be placed a little nearer to each other than the centres of the eyes. In this way the axes of the eyes are not directed through the axes of the lenses, but a little to the outside of them; hence, when looking at an object under this condition, the position of the object is displaced, and appears as if it were the apex of a triangle, of which the base is the line separating one eye from the other; in other words, the glasses must be mounted a little nearer together than usual, and this distance is so small as to be attained even by the rude expedient of bending the arch of the spectacles a little, by which the centres of the glasses are brought closer together.

I obtained a very cheap pair of five-inch glasses, and, although they would not give a clear image when first tried, I softened the bridge by heat, and bent it as just described, thus practically decentering the lenses, with this result that I have now a pair of focussing spectacles that give a clear, bright image on the ground glass, enabling both eyes to be used when focussing, and their use is not accompanied by the slightest strain upon the eyes.

The proper thing to do in the accomplishment of the object desired is to put oneself in the hands of a competent optician, and instruct him to furnish a pair of glasses of the suitable short focus—say five or six inches—and with the required amount of decentering which, as we have stated, need be but very little. Of course, the best and clearest vision is obtainable, theoretically at any rate, when there is perfect coincidence of the axes of the eyes with those of the glasses, but for our purpose decentering is a necessity to enable the necessary displacement of the object to be attained; also, in proportion to the distance between the axis of the eye and that of the lens through which the vision is directed, so does the lens show prismatic colours which have their culmination when the extreme margin of the lens is employed, but this is supposing a case that in all probability will never occur. I have had glasses decentered to a needlessly great degree for ordinary practice, and have not been able to appreciate any colour arising therefrom.

I have hitherto spoken of this as applied to focussing, but a possibly still more useful application of the system will be found in the retouching of negatives. Usually a magnifier of large diameter to accommodate both eyes is employed, for it is a popular fallacy that a large glass of this class is more powerful than a small one. *Power*, in a lens used for magnifying or as an eyepiece, depends upon the convexity of the surface, the flatter the curve the less being the magnifying power possessed by the lens. A very large lens, therefore, cannot be made to magnify so much as one having a small diameter, because a rounder curve—a shorter radius—may be imparted to the latter than can possibly be done to the former. Some writers on the subject have recommended, for retouching, a very large lens, something similar to what is used in the larger kinds of graphascope, one through which any object could be viewed with both eyes—a desirable condition being that the axes of the eyes should not pass near to the edges, but as near to the centre as possible. Now, as I have shown, a lens of this kind implies only a very slight degree of magnifying power, and, were it of greater power and consequently smaller diameter, the axes of the eyes would be opposite the margins, and confusion would arise from the commingling of the prismatic colours inevitably caused thereby.

From a consideration of the foregoing, as well as from trials in actual practice, it will be found that in a pair of powerful decentered glasses mounted in spectacle frames will be obtained a cure for such trouble as may arise in either focussing or retouching, One has the use of both eyes, there is a great deal of magnifying power, and the image is bright and sharp, owing to there being no visible traces of prismatic colours. For these reasons I recommend this system; it costs little, but it is worth much.

CHAPTER XIII.

Cloud-Catching.

On account of the great luminousness of the sky as contrasted with that of the general landscape, an exposure sufficient to bring out all the detail in the latter has, in the great majority of cases, the effect of causing an obliteration of all fine forms of clouds in the sky. In consequence of this, when natural clouds are required to be impressed along with the terrestrial subject, some one or other of several known expedients must be had recourse to in order to effect an equalisation of the exposure requisite for sky and landscape.

A pectinate or serrated flap attached to the hood of the lens has been employed for this purpose by many successful landscape photographers.

It consists of a light flap containing a number of small laths, each terminating in a sharp point, like that of a pencil, and capable of each being raised or lowered in the frame, so as to enable the whole to approximate the outline of the landscape with the sky cut off to suit the contour of the trees or mountains, although not in an absolutely sharp line. When an exposure deemed to be sufficient has been given to the landscape, the flap is raised for a brief period and a quick exposure is given to the sky.

The system first adopted by the inventors of the Pantascopic camera is the most perfect one for obtaining clouds together with a fully exposed landscape. In this camera, it will be remembered, the plate is made to travel by means of suitable clockwork behind a slot in an opaque screen in which the slot is adjustable to such an extent, and is of such form and dimensions as to be very narrow opposite the sky, and to gradually open out as it approaches the foreground of the picture. To enable this to be effectively done, each side of the slot is formed of a wing made of blackened zinc or thin vulcanite curved so as, when adjusted, to admit of a suitable relative proportion of light to the sky and to the foreground respectively. In this system, I repeat, is to be found the means of obtaining clouds and landscape in the most perfect manner capable of attainment.

When this system is applied to the ordinary stationary camera of every-day use, we have a cloud-catcher that cannot be surpassed. To apply it, we have only to adopt its converse as originally applied, that is, to cause the slot shutter to move across the front of the sensitive plate instead of having the plate moving behind the slot. Focal-plane shutters, having a horizontal movement, have been employed for many years, and when driven rapidly across the plate have proved the means of obtaining wonderful results in a good light. It was a shutter of this kind that was employed by Colonel Stuart Wortley in photographing the Falls of Niagara some thirteen or fourteen years ago, the instantaneity being such as to have led to the objection by artists that the picture was devoid of any indication of motion.

To prevent the unsightly projections necessary when the shutter assumes the form of a zinc or other rigid plate being driven across and near to the plate, flexible light-proof bags have been employed to cover the slots in the sides of the camera or dark slide, through which the long exposing shutter—slightly exceeding twice the length of the plate—must move. But for such a bag, light would enter the camera and fog the plate.

Arising out of the above by a natural process of evolution is the curtain or roller-blind focal-plane shutter made to travel horizontally across the plate, and having in it a slot, the edges of which are formed of two opaque wings, curved and capable of adjustment, precisely the same in every respect as the one in the Pantascopic camera, only formed of flexible instead of rigid material. This, when propelled by a spring, forms, both in principle and in practice, the best and most convenient of all cloud-catchers if properly constructed. Two factors determine the rapidity of the exposure capable of being given with a shutter of this nature—the rapidity with which the slot is made to travel across the plate, and the width given to the slot, which, as its slides are curved and adjustable, may be any width the photographer desires, so as to suit the exigencies of lighting.

About eleven years ago I had one of this class constructed for use with a Scovill 8 × 5 camera; but, afraid at first lest the tension of a spring would cause it to travel unequally from end to end I had it driven by the pulling of a string hanging outside. One advantage of this lay in the ability to slightly vary the speed at which it travelled when any dark object in the scene was being impressed, for a tell-tale band of string passing on a pulley on the top of the camera indicated the position of the narrow slot, and at that time I was using a lens of barely over four and a half inches focus for covering the 8 × 5 inches plate.

But what I thought an objection to this was the necessity for the employment of a camera stand when operating, thus rendering it nearly impossible to use it as a hand camera. A spiral or volute spring, however, does away with every difficulty and objection.

CHAPTER XIV.

ASTIGMATISM: ITS NATURE AND EFFECTS.

Since by recent discoveries in the glass-maker's art, and in new properties in certain of his productions, the terms 'astigmatism' and 'astigmatic' or 'non-astigmatic' are becoming more common than they were only a few years since, we find them occasionally glibly made use of by some who have no idea of what is meant by such terms.

It is only since the advent of photography that astigmatism could possibly have applied to any optical instrument, for in no other than a photographic lens is there any recognition of the transmission of a ray obliquely through it, and obliquity of transmission is a condition inseparable from the production of astigmatism. There is no astigmatism in a telescopic object-glass when employed as such, because the rays pass through it axially and not obliquely; but, if mounted as a photographic lens, it speedily shows that it, too, obeys the law which all achromatic lenses have hitherto recognised as regards astigmatism.

What, then, is the nature of astigmatism, and by what means is it to be discovered? Let us take any ordinary achromatic objective and subject it to critical examination by means of the ground-glass focussing screen of the camera. The object to be focussed may be a circular white object the size of a threepenny piece, or it may, perhaps with greater advantage, be a sharply cut white cross, or both, mounted upon a black ground for facilitation of clear observation, or a black cross drawn upon a white card, the limbs of the cross being placed vertically and horizontally. The lens in the camera should be used without a stop, for the larger the aperture the more apparent will be the phenomenon. Let the camera be placed so that the image of the foregoing objects shall be sharply focussed on the centre of the ground-glass screen, and it will be found that the circular one will be quite round and distinct, while both the vertical and horizontal limbs of the cross will be equally distinct, while, if the lens be racked in or out of focus, both will preserve their shapes notwithstanding the indistinctness of outline necessarily caused by this treatment. The camera is next rotated until the objects are brought to the extreme side of the focussing screen, and the racking in and out proceeded with as before. Neither the disc nor the cross will be found to be sharp anywhere, but it will be noted that, at one position, the disc will be elongated vertically, being oval in shape, while, on racking the lens a little the other way, the elongation will now be horizontally, but the mean of the two distances will not show it to be of circular form. With the cross, at one distance the horizontal bar will disappear almost, if not altogether, leaving the vertical one only sharp and distinct, to disappear in its turn when, by an opposite turn of the rack, the horitontal one is brought into visibility. The distance through which the lens has to be moved to produce these phenomena shows the amount of astigmatism possessed by the individual lens at that degree of distance from the centre of the ground glass, for, at the centre, as we have shown, sharpness and correctness of form prevail, the amount of astigmatism usually increasing as the centre is departed from. I say *usually*, but this is not invariably the case, for, in making charts of the amount of astigmatism given right across the whole field by lenses in my own possession, I find that over a considerable portion of the surface adjoining the centre there is no appreciable astigmatism to be found until we approach much nearer to the margin.

Noting that there are two foci to every point projected upon the focussing screen, and that one gives the image as a vertical line and the other as a horizontal line, it is a comparatively easy matter to construct a diagram or chart for every lens that passes through one's hands which will show not only its curvature of field, but the amount of astigmatism from perfection or freedom from this evil at the centre to the full development of the unwished-for propensity at the margin, represented by two lines running alongside each other, and usually drifting apart as they approach the sides of the plate. It would occupy too much space to give in this article an account of an astigmatometer I have devised and constructed for the purpose implied, suffice it to say in the mean time, and pending its publication on some future occasion, the whole capabilities, and failings, and, in short, the character in this respect of a lens may be delineated with accuracy on a sheet of paper the dimensions of the ground glass, and this in about ten minutes after erecting the camera.

A small aperture to a lens improves the marginal definition, the reason of this being that, as each point of the subject is represented by an irregular dot, the smaller the dots the less does their irregularity interfere with one another. The marginal smudginess which thus results from astigmatism is greatly minimised, and in some cases practically extinguished, by a small stop.

But lenses, formed of special glass, have of late been placed upon the market with a claim of their being free from astigmatism, even when used with a large aperture. This all should rejoice at, not merely as an optical feat once thought impossible of accomplishment, but on account of the additional power thus placed in the hands of photographers who like good definition all over the plate, but who may not desire it at the expense of having to secure it by the use of a small diaphragm. Objectives of this nature, from the complexity of their construction—some having as many as eight individual lenses—and from patent restrictions, are not likely to be supplied at what have been designated 'popular prices.'

CHAPTER XV.

Equalising the Illumination of a Photograph.

It is self-evident that the centre of a plate which is nearer to the lens than its margins must be better illuminated than those margins. For this there are various reasons. The diaphragm in relation to the centre is circular, and transmits the maximum of light, and therefore the angular aperture is larger than that by which the sides are illuminated, for, in proportion to the obliquity of the diaphragm to the pencil of rays that are being transmitted, so does the aperture become elliptical and smaller. The focus of axial rays is shorter than is that of oblique ones, which must be elongated, for, were this not the case, we could not get flatness of field. Here, then, are two factors. From the operation of these factors the conclusion must be deduced that the intensity of light in the centre of the plate exceeds that by which any other portion is impressed, and hence that there is a falling off in illumination as we depart from the centre. Besides, there is a loss from oblique impact of the rays on the plate.

To meet the marginal falling off in this latter case, it was one of the claims made on behalf of the now nearly extinct orthoscopic lens that its illuminating powers were more equal than that of the others then existing, and, as I have said elsewhere, much was said and written even by talented opticians of the period to prove its superiority in this respect over the single achromatic landscape lens ; but, although I possess some of the best specimens of this kind of lens that have ever been made, I have altogether failed to discover any superiority in this respect over ordinary lenses.

When it was realised that the orthoscopic lens was no better than the ordinary one, the late Thomas Grubb, of the Bank of Ireland, to whom the optics of photography owe so much, made the statement that the end would be attained by simply placing a small circular piece of brass or other metal a little distance in front of the aperture in the stop, which had to be larger than the piece of metal spoken of. This diminishes the intensity of the light at the centre of the plate, and allows that which is transmitted obliquely to pass without interruption to the margins.

A system which is the invention of Geo. H. Slight, and which I adopted some years with highly satisfactory results, consists in placing at a little distance in front of the diaphragm a small piece of blackened brass or black card of a V shape, base upwards. One or two trials will suffice to determine its best position. This fulfils the following conditions :—It gives a proportionately greater illumination to the foreground than to the sky, and, while it diminishes to any required extent the intensity of the light falling upon the centre of the plate, it gives a great increase to that by which the sides are illuminated. Added to these, it costs nothing, and can be applied by any photographer to his lens without any disfigurement of, or tampering with, the brass work, for the whole appliance can easily be made and fixed in a few minutes by means of a pair of scissors, a bit of stiff black paper, and a little mucilage. When experimenting with Mr. Slight's device I have succeeded in actually turning the tables, so that the foreground was better illuminated than the sky, and the margins much more so than the centre, a wide angle of subject being included.

CHAPTER XVI.

LENS MOUNTS IN ALUMINIUM.

Who of ripe years does not remember the mechanical shifts had recourse to in order to reduce the weight of photographic lenses, especially those of large dimensions? One method consisted in having the front and back lens cells connected, not by a brass tube, but by four rigid wires of suitable length, over which was drawn a cylindrical hood of opaque textile material, such as black velvet. Single or landscape lenses occasionally had as their mount a similar hood, inside of which was a steel spiral spring of strength sufficient to keep the flexible hood distended, the diaphragm being contained in the flat head of the velvet cylinder, the whole capable of being pressed flat against the camera front in which the lens itself was fixed, and thus fulfilling the two *rôles* of lightness and portability. The earlier records of photographic optical history show us that a separate tripod stand, in addition to that sustaining the camera, had been employed for sustaining the weight of the lens alone.

Photographers who seek their subjects out of doors and often far afield, have great reason to bless the man who so greatly lightened the weight of their *impedimenta* by the substitution of aluminium for brass. Who is there that has not examined with admiration an illustration in one of our home opticians' advertisements in which the comparative weight of brass and aluminium is shown by a pair of scales, having in one scale five lenses mounted in the latter metal, and only one in the other, the greater number proving inadequate to the rising of the other.

Within a very brief period the problem of soldering aluminium to other metals has been satisfactorily solved. In early attempts made to effect the soldering of aluminium, only a partial adhesion was secured, and, as a consequence, the one metal could be stripped clean away from the other; but, as the result of exhaustive experiments with alloys, this has now been overcome, and the adhesion may be considered as permanent.

This opens up a prospect of a useful application being made of aluminium in relation to optical instruments, and in a special manner to photographic lens mounts. Any one who has tried to cut screws on either the inside or the outside of aluminium tubes must be aware of the difficulty of doing so with anything approaching to a satisfactory result when contrasted with similar work on brass. I suggest, therefore, that such screwed work be made on thin rings of brass, which may be soldered in their places either previously or subsequently to cutting the screw on them. The advantage of this would be a much greater degree of durability than could possibly be hoped for in an aluminium thread, which, owing to its softness, is apt to wear out soon, whereas we all know the staying power of brass in this respect. Were this adopted, the additional weight imparted to the mount would be inappreciable, while the strength imparted would be invaluable, especially to screws which have frequently to be undone, and, from the greater facility with which such screws can be cut on brass, it could scarcely fail in bringing about a reduction in the price of aluminium mounts, now, largely from its difficulty in working, so greatly in excess of similar work in brass, for, happily, the cost of tubes and casting in the lighter metal has become phenomenally low.

CHAPTER XVII.

PHOTOGRAPHING THE HEAVENLY BODIES BY AN ORDINARY CAMERA.

First of all I desire to disabuse the mind of the average photographer that, in order to practice celestial photography, one must necessarily be possessed of very costly instruments, such as elaborate and large astronomical telescopes, and equally elaborate equatorial stands, with clockwork for driving the same, which are undoubtedly necessary in the observatory in which it is desirable to get out of the heavens all that they contain. But a vast amount of real pleasure is to be obtained by practising celestial photography with such a camera, lens, and stand as all photographers are supposed to possess.

The dimensions of camera in which I have found the balance of advantages to reside is that for 5 × 4 plates, the lens used in conjunction with it being a portrait one, which works with great rapidity of action, covering the above-named plate without any diaphragm.

From experiments on the moon with this lens, I find the concentration of light so great as to permit of an instantaneous exposure being given. As every one knows, the moon sails across the heavens with an apparent quick motion, a motion that will be more readily appreciated if it be examined by a telescope fixed on a stand. With a lens such as that just mentioned, and on a clear night, an exposure of such short duration may be given as to enable a well-exposed negative to be secured—one which, when examined under a compound microscope, shall show, in a well-marked manner, all the salient features of our satellite. This cannot be obtained if the exposure be prolonged, in consequence of the lunar motion, owing to which any departure from instantaneity will give an elliptical instead of a circular shape.

It need scarcely be remarked that, by employing a lens of longer focus than the one mentioned a larger image will be obtained; but, unless the angular aperture of the objective be equal to the shorter one, this will be at the expense of rapidity, unless, of course, the camera be mounted on an equatorial stand, when the exposure may be prolonged to any necessary extent.

I have spoken of a high-class equatorial stand as being expensive. So it is for observatory work, but for ordinary photography it need not be so. It is quite possible to construct one of a somewhat rude appearance for a few shillings, but which will be capable of doing good work. I will describe one of this class, which I had made some time since.

The legs are hinged to a very strong table, on which are two spirit levels standing at right angles to each other. Raised up at a slope from the table is a strong tube, which is fixed very securely. The angle at which it is raised must be equal to the latitude of the place where operations are to be performed. This can easily be ascertained from any good map, in which the lines of latitudes will be found given at the right and left sides. For example: At Kirkwall it would be found to be 58° 59′; at Edinburgh, 39° 56′; at London, 50° 31′, and so on. The tube, when thus erected, forms the polar axis, for it must always point to the pole star, and it must be supported in a steady position by a strong strut. The pole star is not absolutely stationary in the north, but it is quite near enough to serve the present purpose. A rod, which carries the table for the camera, is fitted to pass smoothly into the upright tube spoken of so as to allow the camera to revolve. The table on which the camera sits, and to which it is attached by a thumbscrew, is folded, and is hinged at the front, so as to be capable of being directed up or down and pointed to any object in the heavens. When this is done, a pinching screw secures the hinged part, to which the camera is attached, at the angle found necessary.

No other adjustment is needed for that particular object, which may be the moon, a constellation, or planet. By rotating the camera slowly on it axis, a celestial body may be kept motionless on the sensitive plate for a protracted period. When the lower end of the polar axis terminates in a fine point fitting into a socket, and friction is thus diminished, it is surprising with what ease a heavy camera is made to revolve even by such a flimsy motor as one of those round lever clocks which are sold everywhere at two to three shillings.

To give the proper motion to the camera is a matter of the utmost importance. One way in which I had an equatorial camera stand made, and by which the camera could be made to rotate by hand with a wonderful degree of exactness for a brief period, was by having attached to, and projecting from its side, a segment of a finely toothed wheel, into which geared an 'endless screw' terminating in a handle, one revolution of which caused the segment of the wheel to revolve to the extent of one tooth, the camera being, of course, carried forward in a corresponding degree. It is important that a powerful little telescope be mounted on the same stand as the camera. In the eyepiece of this must be fixed cross hairs, and the eye and hand of the operator must be so tutored that, when the image of, say, the moon is seen on the cross hairs, it must be kept in exactly the same spot by the rotating of the handle of the endless screw referred to.

A very pretty negative of a constellation, suitable for employing as a lantern slide, may be taken instantaneously by the portrait lens already alluded to, or one possessing similar characteristics. In this case a stand, although convenient, is not an absolute necessity. The first thing one will notice is that, whereas with an instantaneous exposur the principal stars of a constellation will only appear in the negative, yet, if the exposure be prolonged, the number of those photographed will be increased; while, by prolonging the exposure still more, stars, so remote and weak as to be incapable of being seen by the eye at all, will be visible in the photograph. This is the principle underlying the new astronomy.

CHAPTER XVIII.

THE TELESCOPIC FOCUSSING FINDER.

Some time has elapsed since, at the Derby Convention in 1886, I submitted for examination a method by which, with the aid of a small pocket telescope, any moving object could be focussed with the acme of sharpness, ready at any moment to be 'snap-shotted,' for the ground-glass focussing screen or the camera is not required, and the sensitive plate in its slide may remain uncovered until the precise moment for pressing the pneumatic ball.

From letters which reach me frequently, I infer that this useful method is but imperfectly known, even by some opticians, and therefore, in the interests of many, both of the optical and lay world, I again give such a description of it as cannot fail to be understood by even a reader of obtuse intellect, if such there be.

It is founded on the obvious principle that a corrected lens, when directed to any scene, produces at its focus an aerial model of that scene, each portion of which presents the same relative distance to or from any other as do the same portions of the original. In a lens of short focus the whole of this aerial model is on a scale so diminutive and compressed, that, except such portions as are close at hand, the distant relations between the others are too close to enable the eye to distinguish easily between them, and hence the saying that every thing beyond a certain distance is in equal sharpness. This certain distance being nearer to the lens, the shorter is its focus; but, conversely the longer is the focus of the lens, the greater is the separation of the component parts of the subject that is being examined, and the farther is that distance beyond which everything is practically sharp.

A little pocket telescope must be obtained, the focus of its object-glass being the same as that of the photographic lens that is being employed. This is of more importance than the fine finish of the telescope body and fittings. To adapt it to the camera it is only necessary that, when the camera has been distended, so that any object shall be focussed on the ground glass as sharply as possible, the telescope must then be focussed on the *same* object, and laid down upon the top of the camera, the eyepiece end being in a position so that the eye can be easily and comfortably applied to it when in subsequent use. It is here, and only here, that the smallest modicum of mechanical skill is required. The reader will see, each for himself, whether he is equal to the herculean task. It is that the eye end of the telescope be fixed to the ground-glass end of the camera, and the object-glass end to the lens end or front of the camera, the telescope itself being pointed to the object at or near the centre of the ground-glass. I do this by sticking a short pin erect in the front and end frame, measuring the precise distance between them, and piercing holes to suit these pins, one each in the ends of the telescope, which must have its sliding fittings made to work so easily that the racking in or out of the camera shall ensure the sliding tubes of the telescope acting in perfect harmony and simultaneity, so that, optically speaking, the pair of lens systems—the photographic and the telescopic—are twin lenses. The simple fitting here described is all that is needed, and, this having been effected, the telescope may be put up, and carried in the pocket, ready to be used at any moment when desired.

How is it to be used, and on what class of subject? Let us suppose it to be a ship leaving or approaching harbour, but constantly increasing or decreasing its distance from the camera; or suppose it to be a group of cricketers or other atheletes on a field, some being near and others rather far from the camera. The dark slide is in its place, and the plate is uncovered save for the instantaneous shutter operated by the pneumatic ball. The telescope is placed in its situation and the eye is applied to the eyepiece, the focussing being secured by the rack and pinion of the camera. When the special object is seen to be sharp, it is at once known that such object is sharply focussed in the camera and is in the centre of the plate. The exposure thus can be made at a moment without having to manipulate the dark slide containing the plate.

I have on previous occasions, spoken of the facility with which the object-glass of the telescope may be made to work in absolute harmony with that of the camera; hence, in this article, I merely assume that both are of the same focus. To again explain the means, simple in themselves, by which both are to be brought to a state of similarity, would require more space than can at present be afforded. Suffice it to say that I have one small telescope fitted with optical adapters, each costing but little, but which enable the same telescope to be used with different cameras fitted with any lens ranging between five inches and twelve inches in focus. But owing to the greater range of definition of a short-focus lens objective compared with one of long focus, it will be among those of the latter class that this arrangement for accurate focussing will have its greatest success.

CARBONATE OF AMMONIA.

By W. B. Bolton.

The subject of development by means of carbonate of ammonia—or, more strictly speaking, sesquicarbonate, for that is the salt invariably used—has undergone a good deal of discussion in the pages of The British Journal of Photography during the past year, with the result that it has been pretty clearly shown that that salt is in no way comparable on level terms, either with the other carbonates or with the caustic alkalies. In fact, while it has long been recognised that the developing values of the caustic alkalies and the carbonates respectively are not proportionate to their alkalimetric values, it has not been generally recognised that the so-called carbonate of ammonia must be classed entirely differently from both, as, indeed, must the other sesquicarbonates as well as the bicarbonates.

Without going too closely over ground that has already been traversed, I may briefly point to the differences that exist between the various forms in which the alkalies may be employed. First, we have the caustic alkalies, or alkaline hydrates, which may be considered as the highest grade or *pure* alkali. Next we have the normal carbonates, consisting of two parts of alkali in combination with one part of carbonic acid. Then follow the sesquicarbonates, containing four parts of alkali together with three parts of carbonic acid; and, finally, the acid carbonates, in which the alkali and acid are in equivalent proportions. The following table will show very clearly the respective compositions when in solution in equivalent proportions:—

Caustic soda..................	$NaHO$	$=NaHO$
Carbonate of soda (anhyd.)	Na_2CO_3+Aqua	$=2NaHO+H_2CO_3$
Sesquicarbonate of soda...	$Na_2CO_32NaHCO_3+$Aqua	$=4NaHO+3H_2CO_3$
Bicarbonate of soda..... ...	$NaHCO_3+$Aqua	$=NaHO+H_2CO_3$

It will be seen that, whether we regard the carbonic acid as a restrainer or merely as neutralising a certain proportion of the alkali, the caustic soda possesses at least as much developing action as either the mono or sesquicarbonates, although they comprise in their formula twice and four times respectively the quantity of the hydrate, for, as we go down the list, it will be seen that the proportion of carbonic acid steadily increases. But, if we look upon the portion of the alkali neutralised by the carbonic acid—that is, converted into bicarbonate—as a restrainer of development, as it undoubtedly is more or less, then we find that, while the caustic soda is a free developer, the others contain a steadily increasing proportion of restrainer until the last, the bicarbonate, is wholly restrainer. I will place their respective developing values in an even clearer light —

		Alkali.	Restrainer.
Caustic soda	$NaHO$	$=NaHO$	
Carbonate of soda	$Na_2CO_3+H_2O$	$=NaHO$	$+NaHCO_3$
Sesquicarbonate of soda ...	$Na_2CO_3,2NaHCO_3+H_2O$	$=NaHO$	$+3NaHCO_3$
Bicarbonate of soda	$NaHCO_3$	$=$ ...	$+NaHCO_3$

Or in plain words, the first is alkali unrestrained, the second contains the same quantity of uncombined alkali plus an equivalent of restrainer;

the next the same quantity of alkali and three times the restrainer; while the last is pure restrainer, without any active alkali.

I may here remark, on the question of classing the bicarbonates as restrainers, that they actually possess a slight developing action if the solution be strong enough, and *applied for a sufficient length of time*, but this action is of no practical value, while the *practical* restraining power is open to easy demonstration: Let a solution of either sodium hydrate or carbonate be divided into two portions, and to one add an equivalent of bicarbonate solution, to the other an equal quantity of water. The behaviour of the two solutions will remove any doubt as to the restraining action of the latter solution.

I have taken the sodium salts as instances in the above calculations simply on the score of convenience, but I will now return to my 'text,' carbonate of ammonia. The normal or monocarbonate of ammonia has the same composition as the corresponding sodium salt, but it is unknown in the separate or solid state, and is only supposed to exist in solution. That is to say, a solution having the chemical composition of the theoretical monocarbonate can be formed by the addition of aqueous ammonia to a solution of either the sesqui or bicarbonate, but the salt that crystallises from the solution thus formed is sesquicarbonate, and that is the compound always used in photography.

Many of the older readers of these pages will be aware that it was in this form that ammonia was first applied to alkaline development, or, at least, it was the form in which it was commonly used with collodion dry plates upwards of thirty years ago. A two-grain solution of 'carbonate' of ammonia, to which a few drops of strong alcoholic solution of pyro were added, formed the staple developer for the old 'tannin' plates, and was what was also employed in the early days of collodio-bromide; and, though it may seem an abnormally weak developer, it must be borne in mind that collodion plates necessitated a much weaker alkaline solution than the gelatine films of to-day will bear. Besides, too, I am speaking of the time when the restraining action of free bromide was not known, or, at any rate, was not used. It was not until 1863 or 1864, when liquid ammonia was coming into use, that the late Major Russell discovered the action and value of bromide as a restrainer, the necessity for which had not made itself felt, as may be well believed, with the weak solution of the sesquicarbonate till then in vogue.

Even at the present day 'carbonate' of ammonium finds occasional mention as a developer, but only under circumstances where an extremely slow action is required, as, for instance, in obtaining warm tones in transparencies with protracted exposures. Here, of course, the difference between the action of the so-called carbonate of ammonia and the other carbonates lies in its different composition and the much larger proportion of carbonic acid to alkali it contains, which, as I have already said, places it in as distinct a position with regard to the normal carbonates as they occupy in relation to the alkaline hydrates. The three different compounds can, in fact, no more be brought upon equal terms by simply varying the strength of the solutions than would be the case if it were attempted to produce a like result with varying quantities of plain ammonia and ammonia with bromide respectively. This is a point that I find it extremely difficult to get the 'average' photographer to recognise, for the idea seems to prevail that, although carbonate of soda is less energetic than caustic soda weight for weight, it is only necessary to increase the strength of the solution to bring about a similar action. It is quite overlooked that, as the developing action is increased, so also is the restrainer. For this reason the published tables of the equivalent values of the alkalies are of no use whatever in comparing a carbonate with a caustic alkali, although they are quite correct for the comparison of a carbonate with a carbonate, or a hydrate with a hydrate.

This leads me to point out that in such a table I published some years ago, and repeated a few months since, the inclusion of carbonate of ammonia was for this reason a mistake, since the figures there given to represent its developing value are in no way comparable with any of the others given. The figures were arrived at chiefly on the basis of the alkalimetric values of the different substances, but the only conditions under which such a table could be constructed, so that the figures would be universally comparable, are practically unattainable, namely, the elimination of the restraining effect of the carbonic acid. If the different salts before use were to be brought to the caustic condition by treatment with calcium hydrate, the conditions could be fulfilled, but then existing tables would have to be altogether altered.

Although, for reasons fully explained, sesquicarbonate of ammonia does not appear to be a developing agent of very general utility, the same remark does not apply to the normal carbonate. On the contrary, there are very good reasons why it should theoretically prove a very valuable one, and in actual practice this really proves to be the case. Many operators employ the carbonates of potash or soda on account of the cleanness and regularity of development, even without restraining bromide, although there are objections in both cases unconnected with the fact of their being carbonates. Others, again, cling to pyro and ammonia *in spite* of the undoubted tendency to abnormal fog the caustic alkali possesses, because they believe it gives them a power and a quality the others do not offer. If, then, the advantages of the carbonates and of ammonia can be combined, as they can, in carbonate of ammonia—not the sesquicarbonate—there is every reason why it should at least be tried.

I have said that the normal carbonate is not known in the isolated form, but it can easily be obtained in solution and of at least as definite a composition and strength as liquid ammonia. Indeed, the same amount of trouble that is involved in gauging the strength of liquor ammoniæ—and that is not much if the specific gravity bulb be employed—will suffice to form a solution of normal carbonate of any required strength. All that is required is to make a solution of the sesquicarbonate or, better still, the bicarbonate, and to add to it the requisite quantity of liquid ammonia to bring it to the composition of normal carbonate. The following formulæ will explain :—

$(NH_4)_2CO_3,2NH_4HCO_3$	+	$2NH_4HO$	=	$3(NH_4)_2CO_3$	+	$2H_2O$
Sesquicarbonate of ammonia.		liquid ammonia.		normal carbonate of ammonia.	+	water.
NH_4HCO_3	+	NH_4HO	=	$(NH_4)_2CO_3$	+	H_2O
Bicarbonate of ammonia.		liquid ammonia.		normal carbonate of ammonia.	+	water.

Thus, by adding two equivalents of ammonia to one of the sesquicarbonate, or one equivalent to one of the bicarbonate, we obtain a solution of the normal carbonate. The salts are easily weighed and the quantity of NH_4HO or NH_3 can easily be arrived at by the use of the ten per cent. specific gravity bulb or by using ·880 ammonia, which contains practically one-third its weight of real ammonia.

Without going into the minutiæ of the calculations, the following formulæ will give the quantities of sesquicarbonate, bicarbonate, and liquid ammonia to form a solution of the normal carbonate of practically the same value as one ounce of crystals of sodium carbonate. The figures are not rigidly accurate, but are made into convenient numbers, which are so close to the exact ones that the difference in use would be inappreciable.

I.

Sesquicarbonate of ammonia	150 grains.
Liquor ammoniæ ·880	2 fluid drachms.
Water	10 ounces.

II.

Bicarbonate of ammonia	125 grains.
Liquor ammonia ·880	3 fluid drachms.
Water	10 ounces.

If the sesquicarbonate be used, only the translucent portions of freshly broken lumps should be taken; but, for uniformity's sake, it will be safer to employ the bicarbonate. In neither case should hot, or even warm, water be used in dissolving these salts. Either of the above solutions can be used in equal volumes with the ordinary stock pyro solution—in fact, may be substituted for the regular carbonate of soda stock. Bromide may be used if necessary.

The quantities of liquid ammonia, perhaps, appear excessive, being, in fact, *more* than would suffice *alone*; but it must be borne in mind that, in the carbonated state, the alkali is far less energetic than when free, and I cannot do better than close with this pointed illustration to the restraining power of carbonic acid and the acid carbonates.

THE PERMANENCY OF ENAMELS.

By Chapman Jones.

Now that praiseworthy and energetic efforts are being made to revive interest in photographic enamels, the permanency of the pictures is a matter that demands attention. There is certainly a disposition among those whose knowledge and observation are superficial to imagine that, because an enamel is produced at a high temperature, it is more permanent than something else that is destroyable by fire, but this is quite a mistake; and, indeed, the idea might almost be said to be wrong in principle. At a high temperature chalk is decomposed and lime is stable, but by exposure to ordinary atmospheric conditions chalk is almost unchangable, while a lump of lime will crumble to powder in a few minutes.

Permanency must always be relative to certain conditions. The most fugitive of silver prints would prove more permanent than a burnt-in photograph if they both had to withstand a crushing pressure or a fall.

The worst-made enamel would obviously stand a temperature that would destroy the best photograph on paper. Considering permanency with regard to atmospheric influences and ordinary contingencies, I should prefer a platinum print to any enamel.

There is probably nothing more permanent, except for its liability to breakage, than good pottery, and under this description we may include a photograph burnt into the hard glaze of the best-made porcelain. But the common enamel of the photographer is entirely different from this. The design is fused into a specially prepared soft and easily fused material which can in no sense be called porcelain. Such enamels as these are far behind platinum prints on paper, and, I think, also carbon prints, as to their probable power to resist even ordinary atmospheric influences. I asked a maker of ornamental tiles of large experience what he thought of the permanency of the common soft enamel, and he quite bore out my own opinion. At the same time, if the word 'permanent' is to be applied to bromide prints, or to any silver prints, it may certainly be applied with greater emphasis to these soft enamels.

HOW TO CUT A ROUND MASK.

By T. N. Armstrong.

At some time or other most workers, be they professional or amateur, fee the want of a round mask of some particular size that they are unable to obtain in the ordinary way of purchase from their photographic dealer. To specially order any particular size means delay, if not indeed a very considerable amount of expense; for manufacturers of masks and discs do not care about incurring the expense of providing cutting dies unless a large and continuous order for such sizes are likely to follow on regularly; and, as it very frequently happens that a round mask of specia dimensions is only needed for some particular case in which only one or two of such are required, the incurring of this expense becomes a serious matter, and frequently deters workers from entering on some particular method of working that they would otherwise adopt.

"Necessity is the mother of invention"—at least, I found it so one day when I wanted a round mask very badly of an exact size that no deale kept in stock, so I set about thinking how I could make one myself, and this is how I managed it.

Having beside me an old pair of compasses which are provided with a pen point, the idea occurred to me to sharpen up one of the points of the pen with a very fine file; after which, placing one of the legs of the compasses on a small piece of cardboard to prevent such slipping when the same was placed in position on the paper it was intended to cut, and turning the cutting point carefully round with moderate pressure, a most perfect circle was cut without any ragged edges.

Hard black needle paper is best to employ, and the same should be placed upon a sheet of zinc or glass, or smooth board of hard wood.

If one of the pen points be kept very sharp, failures will never occur. I am now quite independent of professional mask-cutters, and can with this simple contrivance cut perfectly round masks of any size at will. I strongly recommend my fellow-workers to adopt this simple plan. It is a great comfort to know you can cut any size of mask when required.

COLLODIO-CHLORIDE PAPER.

By G. WATMOUGH WEBSTER, F.C.S., F.R.P.S.

I AM quite of the opinion of the worker quoted by the Editor, who said that C.C. paper had come to stay. To my mind, one of its greatest advantages is that it requires more skill or brains—call it what we like—than is needed with other P.O.P.s to get the highest class of results. The professional photographer who is wise looks to results, not to means, and the more he requires to bring into play his knowledge and experience the more is he able to make his work something apart from that of the average occasional amateur.

I have for some time past been trying to bring into my usual printing-room programme the daily employment of C.C. paper but for a long time the results were disheartening in the extreme. It is one thing to be able to personally make a few careful experiments, but quite another to get the same results in every-day practice from ordinarily skilled printers' hands.

Quite recently the representative of a dealer in C.C. paper, whose first samples turned out well in my own hands, called on me and asked for an order. I sent for my head printer. 'How many good prints did you get out of 100 pieces of the last C.C. paper?' I asked him. 'Not a dozen, sir.' The cause of this was, no doubt, twofold—want of experience and, chiefly, imperfect quality of material. From what I learn from professional friends, their chief difficulty, as also mine, has arisen from cracking of the surface of the prints—a defect not showing till all the work is done. The only remedy I have been able to find is to change the brand. There is no doubt that a great deal depends upon the manner of storage. If the paper is allowed to lie curled up and to get 'bone-dry,' it cannot be wondered at that it should crack. Such, at least, was how I found matters to tend; and now I keep this paper in my own possession stored flat in the coolest place in the premises, and only give out as much as the printer anticipates he may require for the day's work. Since I adopted this plan the prints have been very different altogether, and quite free from cracks. I know of one photographer in the south who cannot get a batch of good C.C. prints by any means; but I also know that he keeps his paper in the hottest and driest place he can, and he keeps it in rolls. My use has been for the smaller sizes mainly, and I buy it ready cut up. There is then less handling and bending, and the result must tend to freedom from cracks.

I also find it impossible to avoid blisters with some samples; but, by using weak hypo, I reduce them to a minimum. When the prints are taken out of this weak hypo, they are passed into a fresh hypo bath half the strength of the first, preparatory to putting them into the washing water.

With regard to toning, I am an irreconcilable opponent of the combined toning and fixing; for, though I believe there is less danger to be apprehended from its use with C.C. than any other, I still oppose its use. There is no single argument that can be offered for its employment with any kind of P.O.P. that cannot also be equally well applied to the old albumenised paper and the use of the combined bath with it. And we all know the fate of the majority of the old albumenised prints so toned.

At the same time, I am not prepared to say that we have arrived at or, at any rate, unhesitatingly decided upon the best formula for toning C.C. I have never yet seen a print the colour of which, in comparison with a good albumenised print, has not a tendency towards crudeness and rawness—not a decided tendency, but still perceptible upon critical scrutiny.

But, in conclusion, I feel compelled to say, that despite these drawbacks I describe and the minor defects caused through want of knowledge, the prints on C.C. possess such admirable qualities of delicacy and softness combined with crispness and force, that no printing room can be considered complete without it.

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THE USE OF THE SWING BACK.

By Francis Cobb, F.R.A.S.

A book which is justly recommended to beginners, in its instructions on the handling the camera in the field, says : 'If it be found that there is too much foreground and too little sky, the camera may be tipped up. In this case, if there be any parallel vertical lines converging towards the top, it will be necessary to bring the swing back into play so as to make the ground glass once more vertical,' and this is the accepted dogma of all such instructions ; but, from inquiries made from many landscapists, I find my own experience confirmed, that it is rarely the case that a satisfactory picture has been obtained when the swing back has been brought into requisition. One reason, no doubt, is that the central line of sight is at one angle while the ground glass is at another, in other words, the two are not at rfght angles to one another. Of course, a small stop improves matters, and in cases of architectural pictures or interiors one must make the best of what is to one's hand ; but here the perspective is generally limited, and a wide-angle lens and small stop does much to mitigate the evil, but the resulting picture is not exactly what the eye has seen, and the perspective has been altered.

A much better plan, when it can be adopted, is to raise the lens by means of the rising front ; it is true that the lens is strained somewhat, but the true perspective is preserved, and the central axis of the lens remains at right angles to the ground glass or plate. In the case of interiors, and frequently of exteriors of buildings, much may be done by elevating the whole camera, and in cathedrals and churches tall steps will generally be found, stowed away somewhere, if only the custodian can be found to produce them. In Chichester Cathedral there is a very beautiful reredos, which, if taken from the top of the tall steps, makes a charming picture, but, if taken from the aisle with a tilted camera and swing back, is altered in its proportions and looks in a print quite differently.

The lateral swing, although the principles underlying its action are the same, appears to act more favourably in altering the perspective ; for instance, a long row of cottages or poplars, which gives on the ground glass an interminable perspective, can be very much improved by altering the lateral swing and shortening the perspective. There can be no rule for this, the operator must watch the picture and screw down to fix the back when he has obtained the best result.

The moral of all this appears to be, that one should not use the perpendicular swing unless in a case of necessity, where it cannot be avoided, and that the lateral swing may be used under certain circumstances with advantage to the picture by falsifying the perspective.

PROCESS WORK: A CHEAP SUBSTITUTE FOR A HAND PRESS.

By GEORGE W. VALENTINE.

FOR those with a shallow pocket, purchase a second-hand iron mangle, with wooden rollers that must run perfectly true, and no blemishes or cracks on their surfaces. If there are any, do not purchase it. See that there is a good spring, with a *regulating* screw on the top of machine, which is most important. If the hand wheel runs fairly true, the machine will answer well for its intended purpose, for a beginner at least.

The wash box, underneath the machine, can be entirely dispensed with.

The only addition that will be required to be fitted to the machine to make it complete will be two iron brackets, to be bolted on each side of the frame, to carry a thick piece of wood—say, two inches thick—for a table on each side of the machine. The top of the table should nearly, but not quite, be on a level with the top surface of the bottom roller.

Further information or queries in the JOURNAL, if required.

PHOTO-MICROGRAPHY.

By G. M. ILIFF.

I HAVE often wondered why so few of our brothers of the camera take up the micrographic branch, as it is most interesting and a very pleasant occupation for winter evenings. I fear too many are of the 'touch the button and the job is done' class, but to those who take a pride in their work and try to *understand* what they are doing (not merely *chancing* things), I would say, Try photo-micrographic work. Many are deterred by *fancied* difficulties. To begin with—supposed necessity for expensive apparatus (bogey No. 1). Any one who is at all handy can rig up an affair himself with a few sheets of stiff brown paper to form the camera extension required. A microscope is not a necessity. For large objects a short focus, R.R. (say, 4 in.), answers well. With the addition of two microscopic O.G.'s (1 in. and ¼ in.), good work may be done. I have tried many forms of lighting—limelight (which I at once discarded as too expensive and too complicated), albo carbon, gas, Sugg's Argand, Welsbach incandescent (which is very good, but is apt to show network of mantle), paraffin three-wick, duplex, and Argand; but a simple paraffin burner with ½ in. wick, using the 'edge of the flame,' answers better than any. I place lamp in my optical lantern which has a 3½ in. condenser, and use a Swift substage condenser fitted in a tube carrying object and O.G.'s. I get a good light with any power from 6 in. to ⅛ in., with different extensions, X 6 to 1200 diameters. I have not met with any difficulty as to visual and actinic foci (bogey No. 2) in a battery of 10 O. G.'s, so I think that may be ignored as a deterrent. For some time past I have used the Hill-Norris (collodion) plate (medium speed), and find them far better for this work than any gelatine plate I have used, either for negatives or positives. Fine detail, which I could not get at all with gelatine, I get without difficulty on the Norris plates; the image also is much brighter, which is a great point when showing negative on screen. For focussing, a finely ground glass, with a thin circle cover glass cemented on with Canada balsam, answers well, using a compound magnifier. I do not use an eyepiece, as I think extra amplification is better obtained by extension. For this work I find a developing formula given by Chapman, of Manchester (hydroquinone and eikonogen), answers well.

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GOING BACK A LITTLE.

By Rev. J. J. S. Bird, B.A.

I'm a good old-fashioned Conservative. No, I am not going to talk politics, but, when I get hold of a good thing, I like to stick to it, and don't want to be always swapping and changing, and seeking things merely because they are new. And even in photography, with all its magnificent developments, there are some things to which workers of many years ago may well cling.

Why has the old-fashioned dipping bath all but disappeared? It is advisable to watch the progress of the *development* of a negative, but who wishes to follow the fixing part? Yet it is very rarely indeed that you meet with or see a dipping bath used for fixing. Your dealer will sell you a set of trays—developing, washing, fixing, &c. Now, nine-tenths of you will develop in one tray, job your fingers into the solution half a dozen times to see if the picture is 'done.' You will then drop the picture into the hypo. In go the fingers after it, perhaps three or four times, until it is finally removed. Then another negative is put to develop. The fingers, all *saturated with* hypo, go lovingly into the developer, and then you wonder why you get stained negatives. Take my advice, always fix your negatives in a dipping bath. The operation is more rapid, more cleanly, more economical, and more effective. If your dealer does not keep the article in stock, it can easily be procured.

Why have dark slides of the book form become all but universal? They are more costly, cumbersome, and unsafe. It is impossible to have a *fixed* partition between the two plates, and without this I do not consider any dark slide perfect. The most perfect slide made is of the American form which Mr. Turnbull has introduced, and, I believe, patented, but which I used years before, in which the bottom of the slide is removed, and the plate slides in. The bottom is then replaced, and the apparatus is ready for use. This form might be produced at a considerably less cost than the orthodox style.

Why don't manufacturers make their rapid rectilinear lenses in focussing jackets? Who would have dreamed of seeing or using an old portrait lens without a rack and pinion? And, with modern lenses, the distance required for focussing is so very small that it could be adapted for fine focussing at very little cost. What a boon this would be for hand camera makers, and how it would at all times ensure greater accuracy?

Why is the old-fashioned plain salted paper nearly out of date? True, a few manufacturers still supply the same, but it is more costly than gelatine or albumen paper; and yet you can make it yourselves with the greatest ease, using thick paper or thin, and, in beauty of tone and finish, can make it equal the choicest platinotype.

I might lengthen out my list to many pages, but I have said enough to show that, in our race after what is new, we are letting slip some of those things whose value has been proved, and which we cannot afford to lose.

FADS.

By J. McIntosh.

Most enthusiasts have certain fads in their apparatus which they would not willingly forego. Some of these are useful only to those who devise them, others are of more general application. I describe a couple of fads in the hope that they may be held to belong to the latter class.

Like most landscape workers, I have a partiality for long-focus lenses, but have found the ordinary tripod head too small for rigidity with a long extension of camera. A large head would be easily made, but is open to this objection, the legs of the tripod are so widely separated at the head, that after a few hours the arm which encircles the tripod in carrying the apparatus from place to place suffers from strain or nerve tire. To erect and take the apparatus apart every time one wishes to focus a "bit" is

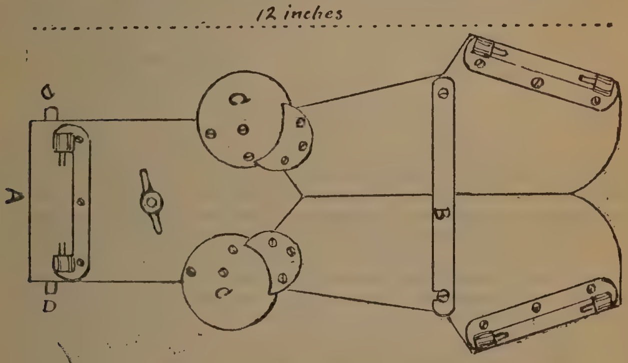

Fig 1

equally objectionable, so I made a tripod head as shown in the subjoined sketches. Fig. 1 shows the under side of the head when used for long extension of the camera. Fig. 2 shows it in the position for carrying or for a short extension of the camera. The legs are sprung in the usual way on the pins which are shown in the sketch, and the camera screwed on with the lens projecting over A. Assuming the head to have been used with a long extension of the camera, and it is desired to move the apparatus more than just a few yards, the brass strap, B, is slipped back off the controlling pin, the two rear legs are lifted off the ground and pulled asunder, the head parts down the centre revolving on the hinges C,C¹, the strap, B, passes between the legs as shown in fig. 2, and engages with the same pin which previously held it and the head is again rigid. The legs are now close enough together to be gripped with one hand for carrying, and are yet far enough apart to be used for eight or nine inches extension of camera. When the long extension is again required, the proceedings are reversed, and the head being then about twelve inches in length gives a perfect support to twenty inches or even greater extension of camera. Figs. 1 and 2 should explain themselves, but a few of the details may bear further explanation. D, D¹, D², D³, D⁴, D⁵, are steady pins, with corresponding holes to bind the parts of the head together. The three parts of the head are united by a pair of back-flap hinges screwed on the sides of the head; these are sufficient when the head is in either of the two positions, but are rather weak when the change is being made. A pair of rule hinges would have been better, but do not appear to be stocked by the

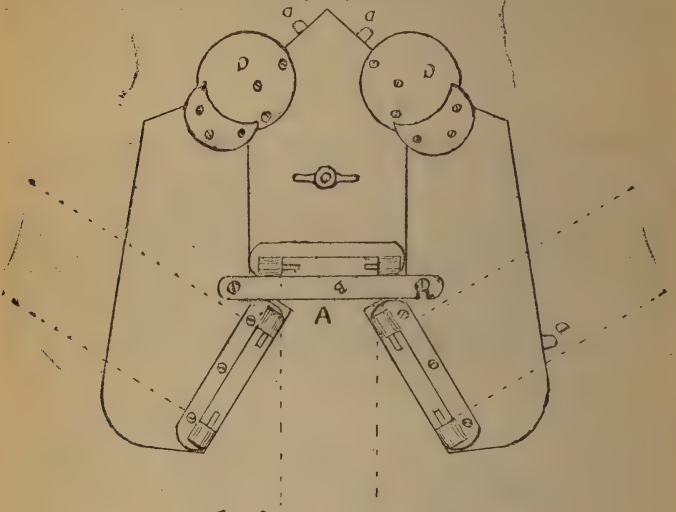
The dotted lines show the direction in which the legs spread

Fig 2

ironmonger in a strong enough form, so I have fitted two discs of spring brass, two inches in diameter, and one twelfth of an inch thick. These are screwed as shown in the sketches to the front part of the head. The discs were turned out of the centre of two pieces of brass, two and a half inches square, leaving, of course, eight corner pieces. Four of these corner pieces are screwed to the rear portions of the head. The bottom pieces are level with the discs and the top pieces overlap the discs, thus preventing any twisting of the hinges when the head is changed from one position to the other. The whole contrivance is well within the capacity of an amateur carpenter, or a working camera-maker would, no doubt, make it at a reasonable price.

My second fad may be useful to those who have experienced a difficulty in obtaining fine focus in dimly lit subjects, such as interiors of cathedrals or in copying line subjects &c. The use of the focussing eyepiece on the ground-glass screen is not always satisfactory, as it enlarges the grain of the screen to such an extent as to confuse the already dim image, and even pieces of thin glass cemented to the surface of the focussing screen do not always meet the case.

For the subjects indicated I had for some time used a screen coated with the carbonate of lead emulsion recommended in The British Journal of Photography. The emulsion was scraped away in places, thus allowing the focus to be obtained through clear glass, but, as the coating became abraded in use, I adopted another plan. I had my ground-glass screen cut into strips about three-quarters of an inch wide, and fitted these into the frame about an inch apart, and focussed difficult subjects with the eyepiece through the interstices, taking care, of course, that the focussing glass was set exactly to my sight. Only those who have focussed the aerial image unbroken by the grain of the screen can appreciate the ease and certainty of the method.

At first the unusual appearance of the screen was a little confusing in ordinary work, but in this, as in many other matters, use soon became second nature.

EXPERIENTIA DOCET.

By R. J. Latham.

Until the spring of this year I always thought that, about so simple a matter as the number of a slide in reference to which of the two plates it represented, there could not be two opinions, but an experience I had then served to alter my view of the matter. I was requested to take some photographs either 12 × 10 or 10 × 8; as my largest camera was only whole-plate size, I sought the aid of an itinerant who was at the time located in our town; he, fortunately having one the latter size, very kindly accommodated me with the loan of it, and as I had not any plates of that size he supplied me with what I required. I got on all right so long as he filled both sides, but one day I only wanted one plate, so he put it, he said, into No. 3, leaving No. 4 blank. I therefore exposed (as I always do), so that when the slide was in the camera the No. 3 was outside and visible at the back; what, therefore, was my dismay when I came to develop to find only a bare plate is easier imagined than described; when I went to him about it, I found out that, contrary to my way, he always pulled out the shutter on which the number was stamped, and that consequently I had exposed the empty side of slide. The lesson to be derived from this is, therefore, when using one plate in any slide not filled personally, or if any one tells you they have exposed a certain plate, to know before using the other which way they are in the habit of exposing.

SUGGESTION FOR A FILM-CARRYING CAMERA,

By JOSEPH H. WOODWORTH.

HAVING partly constructed a quarter-plate camera to carry cut films on what I fancy is a new arrangement, it has occurred to me that a brief description might be of use to the readers of our ALMANAC.

The body is rigid, and so arranged, that when the lens is screwed home, the film in its place will be in focus, there is space for a shutter to work in front of lens, the sides &c., projecting so that a front, when in place, will enclose all. As the film will be always ready for exposure, some mode of keeping out the light while setting the shutter must be adopted if the shutter itself is not provided with such an accessory.

The special feature of the camera is an arrangement for holding the cut films. The holder is hinged at bottom so as to come from the camera and stand at an angle away from it. The film slides into a receptacle in front, which places it in focus, when the holder is buttoned against the camera. Behind is an open box to hold films, narrow or wide in proportion to the number carried, a flap fastened to camera above the button and falling over the box of films, giving an additional safeguard against light. The sides here also project as much as is necessary, and I purpose fitting a changing bag with sleeve, so as to be inside the camera, and shut in by lid at back when not in use.

To work the camera I purpose taking the necessary number of films, passing, of course in the dark room, a thin wire through a hole made, say, with a pin near edge at bottom of film, twisting it into a means of lifting out the film from the box of holder, to slide it into the front of same. A film being in position, I make the exposure, open the back lid, and insert hand in sleeve of changing bag, unbutton holder from camera, and pull out by the piece of wire the exposed film, placing it in the box of holder at outside of a piece of cardboard used to separate the exposed from the unexposed films. I then take out another film from front of cardboard, slide it into position, rebutton the holder against the camera, and shut in the changing bag and sleeve.

I have not yet completed the camera, but think it ought to work fairly well, and, if it comes up to what I expect, it is likely I shall apply the plan to a stereoscopic camera, made so as to allow the camera proper to slide into a thin box to which the changing bag will be attached, for greater convenience in 'loading' or removing the films.

A 'wrinkle' *re* packet Kodak films may be acceptable. Finding some trouble in their development from their persistent 'curling up,' I cut some slips of glass slightly longer and wider than the piece of film, to which the latter is kept by one of small indiarubber bands at the extreme ends, thus holding it flat, while manipulating. The sharp edges of the glasses should be rubbed off on a flat stone before using them.

STEREOSCOPY WITH A HAND CAMERA.

By Thomas Bedding F.R.P.S.

These notes of some brief experiences of stereoscopic hand-camera work that I had during last summer are written with the object of directing attention to a branch of photography which does not receive much notice from amateur workers who, however, will find in it, I am convinced, a very pleasant variation upon monocular hand-camera work. But I warn them that it is surrounded by somewhat different conditions to the ordinary kind of snapshot photography, and that it is not without difficulties which remove it from the sphere of mere button-pressing.

The hand camera I used was so made that the lens board of my ordinary stereoscopic stand camera easily fitted on the front, to which it was secured by means of small brass catches, and a slight rise and fall were available. This interchangeability was, of course, a great convenience and a lessening of expense. Moreover the same slides fitted both cameras. The slides are single ones, the shutters drawing right out. In ordinary hand-camera work, particularly, single slides as such are, I think, preferable to double slides, the risk of two exposures on one plate being thus extinguished, or at any rate reduced to the minimum.

The camera was focussed by means of a lever having a circular movement and actuated from the top of the camera. A pair of single lenses of five inches focus, a Thornton-Pickard stereoscopic shutter (time and instantaneous) and a celluloid focussing screen for use on the stand completed the outfit. When not required for actual work, the detachment of the lens board carrying the objectives and shutter permitted of the camera being racked home and folded up to the dimensions of what one might regard as a tolerably compact hand camera.

Perhaps it will be most instructive if I briefly enumerate the practical disadvantages which, in working, this improvised camera revealed. In the first place, the shutter, an admirable one, is perhaps not the best adapted for hand-camera work, the pneumatic release now and then, having a tendency to play one false or leave one in doubt as to whether the exposure has actually been made. In hand-camera work it is, essential that one should feel, as it were, that the exposure has been made, hence a spring catch release is required. If I could persuade the Thornton-Pickard Company to fit such a release to these shutters, I believe that others besides myself would appreciate it.

In holding the camera—a good-sized one, it will be obvious—I found that it was best kept level and steady when pressed firmly against the side just above the left hip. Held in front of one or against the breast, there was a tendency to tilting—a fatal thing in stereoscopic work, where you require absolute correctness of lines in both halves of the double negative. The position in which I was obliged to hold the camera rendered a finder absolutely necessary, the attempt to do without one, now and then, being responsible for my not getting the figures on those parts of the plate I had calculated they would occupy. Here I would interject the remark, that to me the great charm of stereoscopic hand-camera work is the wide field it opens for instantaneous figure work, rarely to me quite satisfactory or pleasing when rendered with the single camera.

I have so strongly advocated dark slides for ordinary hand cameras, that I almost hesitate to say that when working half-plate size they entail a degree of trouble which almost neutralises whatever advantage they may possess. The size is certainly a serious item; and with those I used there was always a great risk, working *en plein air* and without a focussing cloth, of the egress of light, on account of the "cut off" not being above reproach. To remedy this, I occasionally strapped a cloth round the rear part of the camera, but it was troublesome to manipulate.

I am not practically acquainted with any of the commercial stereoscopic hand cameras, so that I cannot say if the drawbacks of the one I employed are possessed by others; but, if any of my readers contemplate adopting this kind of work next season, possibly they may profit by these hints in the selection of a suitable instrument. There is, I think, plenty of room for a few good stereoscopic hand cameras, and I am surprised that the makers do not introduce more of them.

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HOW NOT TO DO IT.

By C. Ray Woods.

How not to do it, No. 1.—Do not use the combined bath. Used carefully and freshly made up, a print *may by chance* be fairly permanent. Within this last twelvemonth I have been in charge of an album contributed to by many workers. The combined bath prints I soon learnt to recognise by the tone (seldom a pleasant one). Looking at that album now, I see some deplorable examples of fading in six months, and all combined bath prints. For my part I love a warm tone, and that means little gold; yet I rejoice to see my own prints keeping the same colour, though whether that colour pleases others I care not. They are keeping, at all events, and, though I fully expect them to fade in time, I am certain of this, the prints that outstrip them in permanency will be more gold-toned, but *not* with the combined bath.

How not to do it, No. 2.—Stereoscopic views.—I have just seen a most ingenious arrangement of two silver on glass mirrors to take stereoscopic pictures with one lens. An attractive feature of this is that you can print direct and mount direct without reversing the two prints. But the laws of optical reflection which allow this bring in another fault; right and left are reversed in the objects of the picture. For some subjects it may not matter, but I strongly object to seeing dear old Table Mountain knocked down and built up again, *vice versâ*. Speaking of stereoscopic slides, I lately came across an advertisement in a copy of the *Illustrated London News* of forty years ago: 'Prints four shillings and sixpence a dozen (I consider it worth all that to simply mount them properly); transparencies from three shillings each.' Mem. Good transparencies still fetch respectable prices. May the time never come when lantern slides will be sold for threepence a piece. That would be *How not to do it* indeed! What rubbish those four-and-six a dozen stereoscopic pictures must have been. No wonder the instrument fell into disrepute. Take heart, ye stereoscope revivers, but remember this time *How to do it*.

This *How not to do it* text might furnish a sermon to cover the whole photographic art and science. I have just applied it to a few recent matters which come to mind at the time of writing.

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LUMINOUS OR PHOSPHORESCENT PHOTOGRAPHS.

By Thomas Bolas.

When the luminous or phosphorescent paint was introduced, about fifteen years ago, one of the first suggested applications was the painting of the backs of prints, so that, after exposure to light during the day, the photograph should be visible in the dark. It was, however, soon found that the sulphuretted hydrogen slowly evolved by the decomposition of that sulphide of calcium, which is the essential constituent of the luminous paint, soon played havoc with all silver prints. If, on the other hand, carbon prints were used, the sulphuretted hydrogen was certainly harmless to the photograph, but the slow decomposition of the luminous constituent of the paint involved the gradual lessening of the phosphorescent property. Somewhat better results were obtained by making the carbon print as a transparency on a glass plate and backing it with the luminous sulphide of calcium imbedded in a layer of paraffin wax; but even in this case the sulphide of calcium often decomposed owing to the separation of the layer of paraffin wax and the glass plate, and the consequent access of air to the sulphide.

The luminous powder is now largely used hermetically sealed in glass tubes, and these tubes make a phosphorescent surface which is permanent in the most real sense, and laid close together as a backing in the frame they give a perfectly satisfactory surface for a waxed print, or for a transparency on glass when a luminous photograph is desired. In the latter case a sheet of ground glass may be interposed to break up any ruled appearance resulting from the use of the parallel tubes—an appearance only noticeable, however, when rather large tubes, say an eighth of an inch in diameter, are used.

It might be supposed that the cost of a surface built up of tubes would be prohibitive, but it is found that, if the drawing of the tubes, the filling and the sealing are done with the help of modern machinery, a surface made up of sealed tubes about an eighth of an inch in diameter costs actually less than a similar surface of plate glass painted at the back with the luminous paint or covered with the paraffin composition.

The luminous tubes, which are sold in London at the old agency for the luminous paint (Horne, White Horse Alley, Cowcross Street), are now manufactured in sizes ranging from about one hundredth of an inch in diameter to about an inch external, with three-quarters of an inch bore, the small sizes being used on the needles of indicating instruments and in the eyepieces of astronomical telescopes, while the larger and stronger tubes are employed in making luminous surfaces and datum marks on breakwaters, pierheads, and generally in connexion with marine engineering.

NOTES ON WORKING PRINTING-OUT PAPER.

By Edward Dunmore.

I have found that, in case of much over-printed proofs, too dark as they are to be of any use, if, after the preliminary washing and removal of the free silver, they are placed in a bath consisting of salt and alum, strong in salt, say, two ounces to the pint of water and one ounce of alum, for ten minutes, and well washed before toning, they will reduce considerably in the fixing bath, sufficiently so to make them presentable. The colour will be slightly more grey, yet they still will remain of a bright and pleasant tint, and the proof will be saved. In my experience, more even tones are ensured by a weak salt and alum bath prior to toning, to say nothing of the more pleasant state they are in for handling and subsequent operations.

With regard to the sulphocyanide and gold bath, I find it always works well if, on addition of a few drops of solution of gold chloride, an evanescent clear deep red colour takes place after a time, and, by further use of the bath, this colouration, on addition of fresh gold chloride, becomes paler, till it eventually becomes of a muddy dirty yellow. The bath now, although it will tone after a fashion, will not do so properly, and the time occupied is excessive. If all is in proper working condition, from three to five minutes will produce the best colours obtainable on P.O.P.

REAL JAM AND CARBON AS A PARTIAL SUBSTITUTE FOR SILVER IN PHOTOGRAPHY.

By A. L. Henderson.

The above heading may appear somewhat startling, but, nevertheless, is true, and this is how it has been revealed to me. On one of my late excursions I had the misfortune to run out of my favourite dry plates; I was forced to adopt 'Hobson's Choice,' and use a to me unknown plate, a slow one which should have given a good negative fairly free from halation. Having to photograph a church interior badly lighted from a stained glass window, a fifty minutes' exposure only gave fearful halation in the window, and little or no detail in the church. A second attempt was necessary, resulting in a perfect negative. My *modus operandi* was as follows:—

Not having any regular backing for the plates, I procured some wood charcoal from a druggist, and some jam from the kitchen, I mixing them together so as to make a thick paste, then brushing it over the back of the plates, carefully supplementing it with a dark piece of paper in order that the springs of the dark slide should not get dirty. An exposure of an hour produced a magnificent negative, free from all halation and full of detail. I am sure your readers will exclaim, Is this better than caramel? Well, I say, Yes. Lamp, or any other dead black is better than any transparent colouring, with transparent colour it is only a matter of time before reflection takes place. Mr. Andrew Jameson (in his elementary manual on steam and steam engines) gives a table of comparisons of radiating or absorbent and reflecting substances as follows:—

	Radiating or Absorbent.	Reflecting.
Lamp-black	100	0
Water	100	0
Cast iron polished	25	75
Wrought	23	77
Steel	17	83
Brass bright	7	93
Silver bright	3	97

Of course, the jam is only the vehicle to hold the carbon, any treacly or gummy matter will answer. I much prefer a substance that will dissolve in the developer; there is no necessity to remove it before developing, it is a safeguard during that operation. I have made several experiments lately that bid fair to revolutionise plate-making. The best solution to thin the carbon paste with is methylated spirit.

DISTORTION OF THE FEATURES IN PORTRAITURE.

By H. S. Starnes.

Artists tell us that photography can never be a fine art, and to an extent they are correct, because I take it that 'art' is supposed to give, not necessarily what is a scientifically correct reproduction of an object, but rather a representation of what that object appears to our sense of vision.

One set of prophets taught us that it was the sharpness of detail that was the cause of the failure of photography, forgetting that an etching, which is produced by a series of scratches of a needle-point, is allowed to be an artistic production. Others thought it would be all right if we used isochromatic plates. Both these sets of teachers gave us a lift on the road to better results; but they do not attempt to grapple with the one great curse of photographic work, and that is what one may almost call the distortion produced by our lenses. This word 'distortion' may not be the best to use, but I think it best explains my meaning, because to our eyes it appears that it must be distortion what the lens produces.

If I look at a view of an old house, with some mountains behind it, my mind can appreciate the dimensions of those mountains; but in a photograph they will appear like little hillocks, and possibly a little gate-post or something of that kind in the foreground will so obtrude itself as to still further destroy any idea of space behind the house.

Of course, an artist would reduce the size of the gate post and exaggerate that of the mountains and the clouds beyond them, and his representation of the subject would appear far more true to nature than my photograph. The reason of this is, that the eye, in its automatic change of focus from point to point, *does not at the same time fully recognise the laws of perspective.* For instance, if I look at a group of a child's ninepins at the other end of the table, as I look from one to the other, my mind can grasp the fact that they are all of one size, but a photograph of them from the same place would appear quite unnatural and distorted.

Again, in the case of a photograph of a family group, often one sees the head of a small child, sitting down in front, nearly twice the size of that of its father, standing only a yard or two behind.

We can see the apparent distortion in cases of this kind, but I for one never realised, until I went into the matter, to what an extent this false representation is produced in ordinary portraiture, say in the case of a *carte-de-visite* vignetted head.

One often hears people say that the best portrait they ever had was a small one in a group. This was because it, being small, was nearer to scale. On the other hand, one sometimes sees vignettes of decidedly plain people appear as if they had perfect features. The lens had enlarged some of the features and reduced the size of others, with the most satisfactory results.

Now, to prove that this is really a fact. Photograph a vase, or something of that kind, about the size of a human head, with various points of detail upon it that can be accurately measured; use a five-and-half or six-inch focus lens, at two, three, and five yards' distance from the object. Then put the negatives into the lantern at a distance from the screen that in each case will give the nearest point of detail of the exact size of the object. It will be found that only the negative taken at *five yards' distance* will give the other details true to scale. Now, we can understand what artists really mean when they say that a photograph is false to nature, though I believe that not one in fifty of them know where the fault lies. Just think for one moment that one has to get at least *fifteen feet away* before a lens of the above focus will represent an object *one cube foot* true to scale. Probably we shall find that the greatest help received in the last twenty years to really make photography an art is the introduction of Dallmeyer's tele-photographic lenses. Or we may take very small negatives with ordinary long-focus lenses, and enlarge from them.

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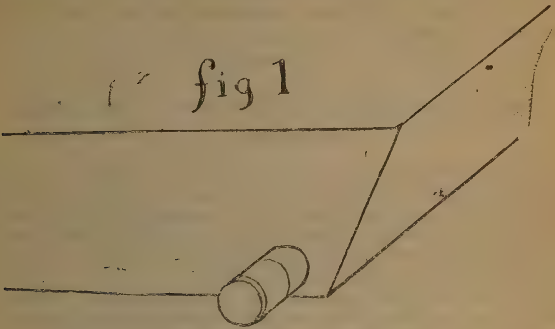
WASHING AND DRYING COLLODION EMULSION PLATES.

By J. S. Teape.

Although at the present time gelatine undoubtedly takes the sway, there are many of those who used collodion years ago still use that medium for certain purposes. Collodion emulsion is not yet surpassed, if equalled, for transparencies by any process at present. For simplicity gelatine cannot compete, and for this reason, no doubt, many of the more recent converts to photography are led to practise the art of making lantern transparencies by collodion emulsion. I venture to think that all those workers will find in the little apparatus which I am about to describe a simple and efficient mode of drying the plates after coating them with emulsion. The drying rack can, of course, be used for drying plates coated with washed emulsion, and is to be preferred to many of the slipshod methods used by some.

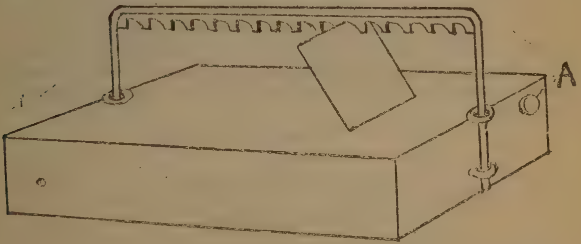
The emulsion will dry steadily, and the surface is protected from dust by reason of the coated surface being inclined downwards, but there are many who, for reason of economy, will sometimes use an unwashed emulsion, either for want of time to complete a washed emulsion or for want of money to purchase double the quantity of solvents, also for want of an efficient washing apparatus. These dear brethren need not quake, for they may produce just as good results with unwashed as washed emulsion, and very easily if they will get or make these two pieces of apparatus. First, make a dish of stout zinc, 13½ × 10½, this will hold a dozen lantern plates with a little room to spare. Procure a small brass needle case, cut off quite half of the body so that you have the movable lid and a piece of the body to receive it. This must be soldered on to the dish as at fig. 1, after a hole has been bored into which the tube will fit tightly.

fig 1



Any one who has attempted to wash several plates in one dish will at once see the utility of this little tube; there will be no need for tilting the dish to pour the water out, just remove the little cup and the dish will empty itself. Three or four changes of water will do. The plates will remain where they are placed and not damage each other. This dish should have a good coat of black varnish. Fig. 2 is the drying arrange-

fig.2



ment. The base is a tank made of stout zinc, 18 × 12 × 3½, with screw cap at A to allow of its being filled with boiling water. The rod is of brass nearly three-sixteenths of an inch thick to which a strip of zinc serrated, is soldered, as shown. The slots are formed by fixing into position some thick copper washers which may be purchased at any ironmonger's. In use a double thickness of blotting-paper is placed on the surface to rest the plates upon. Two or three of these racks may be used with the tank which may be made of different heights to receive various sizes of plates.

RECOVERING GOLD FROM TONING SOLUTIONS.

By A. Haddon.

It is well known to chemists that gold is precipitated in the metallic state from solution if sulphurous acid be passed into the same for a short time. It occurred to me that we might take advantage of this fact in order to recover any gold that might be left in a toning solution which had done the work it was called upon to do, but which work had not thoroughly removed all the previous metal.

The favourite toning solution for gelatino-chloride paper is, undoubtedly, the sulphocyanide, and my remarks apply specially to that toning bath. If it be kept after it has been used, especially if made alkaline or neutral by the addition of a small quantity of carbonate of soda, it usually turns reddish, due to the precipitation of gold in a finely divided state, and in this condition I have seldom found it work satisfactorily; a fresh bath therefore is the best way of enabling any one always to produce the same and satisfactory tones.

When the bath is done with, add to it a small quantity of sulphite of soda, and then any strong acid such as hydrochloric or sulphuric (not nitric) till the solution smells strongly of sulphurous acid. In this condition leave the solution for twenty-four or forty-eight hours (it is best to close the bottle with a cork or stopper to prevent the escape of the gas), at the end of this time a brownish deposit will be found at the bottom of the bottle which is metallic gold. Old toning baths can be saved in Winchester quarts, and, when a sufficient quantity of solution has accumulated, it can be treated as above. The supernatant liquid can be poured off and the gold collected from the different bottles on a filter paper in a funnel. The precipitated gold can then be dealt with as desired, *i.e.*, either converted into chloride for use or sent to the refiner with the other residues.

MY CAMERA AND I.

By Mark Oute.

'Over the hills and far away,'
Under the summer sky,
Roaming about the live-long day
My camera and I.

Out of the city's trouble and strife,
From the daily worry we fly,
To revel 'midst country scenes and life,
My camera and I.

In forest green, with glistening sheen
And tangled boughs awry,
With reflections clear in moat and mere,
My camera and I.

Then down the stream, as in a dream,
Or on the lake, we ply,
Amidst the blaze of sunny rays,
My camera and I.

By mount and tarn, by bog and burn
We foot it, wet or dry,
Hunting for beauties at every turn,
My camera and I.

Here's the old mill—the wheel now st
The gliding lade now dry,
A picture shows, old age, repose,
My camera and I.

The singing sea sends up with glee
The sparkling spray on high,
The boats they ride on the restless tide,
My camera and I.

On the sandy floor of the shingly shore,
There endless groups we spy,
Of subjects a wealth, to be had by stealth,
My camera and I.

Hither and thither, art treasures we gather
Under the changing sky;
Strange effects watching, nature's moods catching
My camera and I.

Till our holiday done—'twas a glorious run
We homeward now must hie;
Reluctant and slow, we are sorry to go,
My camera and I.

Back to the town, with its grimy frown,
Settling to work with a sigh
For the happy time of our little rhyme,
My camera and I.

A FEW NOTES ABOUT ACETYLENE.

By J. Hay Taylor.

So much has of late appeared in print respecting the means of generating acetylene gas from calcium carbide and water that many persons have tried making and burning it on a small scale, with the general result that they obtain a flame that is certainly brilliant, but also one that gives off so much smoke or soot that they are glad to cut the experiments short because of the shower of smuts that soon permeates the room in which it is burned.

Acetylene is so rich in hydro-carbon that it is necessary to add a large proportion of air in order to make it burn without smoke; but, in adding air, it must be borne in mind that it becomes more or less explosive according to the proportion mixed with it. The explosive point is reached when one volume of acetylene is mixed with one and a quarter volumes of air. In this proportion it is only explosive in a slight degree; but, as the proportion of air is increased, the explosive power is also augmented, it reaching its maximum when twelve volumes of air are combined with one of acetylene. As the proportion of air increases beyond this proportion, so the explosive nature diminishes, until, with twenty volumes of air to one of acetylene, it no longer forms an explosive combination.

It is quite possible that at no distant date acetylene gas will be in general use, first perhaps as a means of enriching house gas, and in all probability soon after it will be used in connexion with a special burner, and supplied through the present companies' mains in place of the house gas as at present; seeing there are many districts where house gas is supplied of such poor quality as to be quite unreliable, it is to be hoped that the commercial introduction of acetylene will soon take place.

Seeing that the acetylene flame is white, and of a uniform luminosity, it might also be employed as a standard of light.

ARRANGEMENT FOR PLATE-BACKING TO PREVENT HALATION IN LANDSCAPE WORK.

By W. Washam.

I have often noticed plates put forward as securing perfect freedom from halation. Whether there may be any that attain this desirable end, I am not prepared to say. In my landscape work I have generally preferred to give rather full exposures, and have found in a very varied series of plates halation almost constantly present wherever circumstances were at all favourable to it. Two years ago I constantly backed my plates, both English and Continental, with paper sold for the purpose by an English firm. Theoretically, I had my doubts as to whether it would prove effective because of its smooth surface and orange colour, many of my plates being orthochromatic, and during the summer of 1893, in Germany, made a considerable series of trials with very varied landscapes. My greatest trouble throughout was from the halation. If I make a further analysis of these negatives, I may be able to satisfy myself as to which plates are most free from it; but I think, where circumstances are at all favourable to it, the safest thing is to back the plates, and this year I have done so with one of the non-actinic mixtures recommended, which dries quickly, and can easily be removed with a wet sponge, and so far I have had no further trouble. I come now to the main purpose of this little article

When I resolved that my plates must be backed, the question arose for me how to do it in the simplest and easiest manner, and how, at the same time, to avoid any dust that might arise from abrasion of the backing in plate boxes, &c. With paper backing, I should have had no fear of this latter. I pointed out to the maker or vendor of that which I used that the smooth surface would be calculated to reflect a certain amount of light, and this light, being of an orange colour, might prove detrimental with orthochromatic plates. I suggested that he should provide a paper with matt surface, and of a colour that would absorb all actinic light. I do not know if he has taken the hint; I noticed that he looked upon me as rather a novice.

To secure dispatch in applying the other kind of backing and absence of dust from its abrasion, I make the following arrangement. Let me premise only that for outdoor work I have nearly always used Mr. George Hare's patent plate boxes, which, as the smaller sizes take each eighteen plates and the larger one dozen, I find a great convenience. I was much afraid, if the backing were not kept carefully from the edges, the friction of these latter, sliding in and from the grooves, might produce dust, so I proceed as follows. I will suppose the size to be half-plate :—

Take two pieces of cardboard, one, a_1, quite thin; the other, b_1, nearly the thickness of the plates, and of such a size that, when six pieces slightly larger than the plates have been cut out of each, a margin of about an inch may be left round the edges and between the plates. It will easily be seen that, if the plates ($6\frac{1}{2} \times 4\frac{3}{4}$) be arranged along the boards in two rows of three each, and so that their lengths lie across the board, the measurements of the boards must be $4\frac{3}{4} \times 3 + 4 = 14\frac{1}{4} + 4 = 18\frac{1}{4}$ inches long and $6\frac{1}{2} \times 2 + 3 = 13 + 3 = 16$ inches broad. On a_1, the thinnest board, mark out, by means of measure divided into inches, &c., with flat ruler and pencil, in two parallel rows of three each, places for the six plates, and cut out the six pieces of cardboard so that the six plates will just fit nicely into their places. This may be done very nicely by means of a strong knife, with edge well sharpened right up the point, such as a shoemaker's knife, a flat wooden straight-edge, not too thin, and a board, like a drawing-board. The cardboard laid on this latter, the straight-edge adjusted to one of the pencil lines and held firmly down with the left hand, while the knife, the blade moving against the straight-edge, is drawn along with the right hand as many times as are necessary to make a clean cut through. Generally, with thin cardboard, one cut will be sufficient; but it must be so placed that the cut comes across the grain of the drawing-board. Mark on one corner of this cut-out piece a_1, and on one corner of the other b_1. Lay these together so that the two boards exactly fit. Now run round the pencil, so as to mark the places for the plates on b_1, and cut out the rectangular pieces, as in a_1. By bringing the corners a_1 and b_1 together inside, the holes will always coincide. Now take two other pieces of the same size and mark a_2 and b_2. The former should be rather stout, the latter may be less so. Take a_1, a_2, wet the front sides with a damp sponge, and apply strong gum or glue, or whatever you are accustomed to use, to the backs (I generally use gum), bring them together and rub down with something hard and smooth, so as to bring the gummed surfaces into close contact, and put between paper under pressure to dry. Proceed in the same manner with b_1 and b_2. Now, on the two inner corners, instead of the pencil marks a_1, b_1, put in ink a large A_1 and B. Take the latter, and, in the hollows left for the plates, mark round with pencil lines, at one-eighth or three-sixteenths of an inch from the edge. That will give rectangles 6 × 4¼ inches, or rather less; cut out these pieces as before. Our backing frames are now ready for use. I generally colour them myself with some non-actinic colour, and, when thoroughly dry, varnish them.

To Use the Frames.

Having got everything ready, the lantern on a table, giving a non-actinic light just sufficient to enable you to see what you are about and not enough to be dangerous for the plates, the A_1 frame, face up, in front of the lantern, lay six plates face down in the hollows. On these place the frame B face down, and the corner B on the corner A_1. It ought to fit so as just to take the upper parts of the plates into the hollows on its under side and to let the backs of the plates appear through the holes at the upper side, all except the one-eighth or three-sixteenth-inch margin all round. It is from this margin that we wish to keep the backing medium. With a sufficiently stiff brush spread it evenly over the other part (not too thickly), bringing it quite up to the pasteboard margin all round. Now remove the B frame, and you see your plates nicely backed with a beautifully clean margin, so that there need be no abrasion producing dust from the edges of the slides, grooves of plate, or changing boxes &c.

If it is desired to back a dozen, or larger numbers of plates rapidly at one time, one or two extra frames A_2 A_3 &c., may be provided. Then, A_1 being removed with the backed plates upon it, another half-dozen on A_2 may be proceeded with and then removed, giving place to A_3. By this time. probably sooner, the backings of the first set will be quite dry, and the plates may be removed to boxes or slides, setting A_1 free for further use, This process may, of course, be continued indefinitely. I am writing this in case it should be useful to any others wishing to work under similar conditions.

STEREOSCOPIC BITS.

By Edgar Clifton.

Flowers, crystals, and many small curios form excellent subjects for stereoscopic work; care should, however, be taken in photographing them that the lenses are not too widely separated; a single-lens camera is the best for this purpose, as, when photographing any near object, as a small fossil, a separation of one inch is quite sufficient to give a proper idea of relief.

Paper stereoscopic slides can be conveniently mounted in optical contact with a clear white glass of the standard size, in the style generally known as 'opaline.' This to a great extent obviates the granularity usually visible on paper slides.

If some obliging manufacturer would furnish us with matt-surfaced celluloid coated with a good printing-out emulsion, it would greatly facilitate the production of transparent stereoscopic slides. The celluloid could easily be cut for transposition of the pictures, while a stout cut-out mount would at the same time ensure flatness and protect the surface of the film from abrasion.

A couple of stout mounts with cut-out apertures of the correct size.

bound together at the ends with stout paper or tape, affords a handy means of adjusting paper prints before trimming and mounting. After the best position for the prints has been found by placing them between the cards and sliding them slightly from one side to the other, a blunt tracing point may be run round the opening, and the print afterwards trimmed to the line so made.

Many people have never been able to see a picture properly in the stereoscope. This is usually due to a great disparity in the two eyes. If an ordinary single unrimmed eyeglass of suitable focus is placed over one of the eyepieces, it will generally be found that the pictures will be seen to unite perfect and give the desired effect of solidity.

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A CHEAP DARK-ROOM LAMP.

By H. A. Railton.

A very good dark-room lamp can be made with a hock bottle.

Procure a hock bottle, which can easily be had from an hotel, and knock the bottom out. There is no need to cut round it with a diamond or a file, but simply hit the centre of the bottom with the end of a poker, or, better still, with a mason's chisel, as you can take a shorter hold, and have more control over it.

All that is now necessary is to take half a candle, which is quite long enough, light it, and set it standing in a convenient place, and put the bottle over it, as you would place a chimney on a lamp. There is no need to cover the neck of the bottle.

Such a contrivance will give a splendid light for developing, and colour of the bottle is quite safe. Perhaps it will be necessary to put the end of a match under one side of the bottle for ventilation.

With a litttle extra trouble a suitable stand may be made to hold the candle.

I have developed many plates with this lamp, and have had no trace of fog.

◆

THE EFFECT OF KEEPING PLATES AND FILMS AFTER EXPOSURE.

By W. H. Barnes.

There is some difference of opinion among experienced photographers as to whether, if an exposed plate or film is kept for any length of time between exposure and development, there is an alteration in the latent image, and the general opinion with respect to plates has been, that a plate may be kept for a considerable time without there being any noticeable change; but, in the case of celluloid films, it has been asserted that, if an exposed film is kept for even a few weeks before development, the latent image fades or becomes less capable of development.

To test this point, the writer carried out the following experiments:—

Some plates and films, coated with the same emulsion on January 3, 1894, were exposed on February 9 of the same year, both plates and films receiving exactly the same exposure, the exposures being made in the studio on a day when the light was very steady, a necessary condition to ensure the exposures being all exactly alike.

One of the exposed films and one plate were developed at the time, and yielded identical negatives, proving that the plates and films were of the same speed.

On April 10, two months after exposure, another plate and film were developed, both giving excellent negatives, there being no difference evident between them. Comparing them, however, with the other films and plates exposed at the same time, and developed at once, both plate and film developed, after being kept two months, had the appearance of having received a slightly fuller exposure.

A further trial was made on October 26, more than eight months after exposure, by developing one plate and two films, which had been packed during this time in the following manner, the two films face to face, and the plate face to face with an unexposed plate from the same box. One plate and one film of this set were developed together in one dish with the same developer; both developed readily, but showed apparent over-exposure, which was slightly more pronounced in the case of the film. The remaining film of the set was developed with a more restrained developer, and gave a good vigorous negative.

On the same date, October 26, another set of one plate and two films, which were exposed on February 9, at the same time as the others, and which, during the interval, had, in order to test the effect of celluloid in contact with the latent image, been packed with the face of each plate and film in close contact with a sheet of celluloid, were also developed with exactly similar results to those yielded by the previous experiment, both plate and film developing readily and cleanly, but showing apparent over-exposure, the film to a slightly greater extent than the plate.

The results being identical, whether the face of the exposed plate or film were left in contact with plain celluloid or with the emulsion-coated face of another plate, shows that the celluloid had no prejudicial effect upon the latent image.

From these experiments it would appear that not only is there no fading of the latent image, but that there is a slight progressive or continuating action of the light, comparable to that which occurs in the case of exposed carbon tissue, and that the treatment indicated, when a properly exposed plate or film has been left for months between exposure and development, is the use of a more restrained developer such as would be used in the case of known over-exposure.

No single set of experiments can be considered as affording conclusive evidence in a question of this kind; but, although further trials may afford another explanation, the writer considers that the most reasonable explanation of the change which (as shown by these experiments) takes place in the latent image when an exposed plate or film is kept for a lengthened period before development is to be found in a continued action of light.

The plates and films used were Messrs. B. J. Edward & Co's. instantaneous isochromatic; the experiments would have been more complete had a duplicate set of trials been made with ordinary plates, and the results compared with those obtained upon colour-sensitive plates; but there is no reason to expect that the results obtained on ordinary plates and films would have been different to those here recorded.

MYSTERIOUS LANTERN SLIDES.

By James Martin.

They came under notice in the following manner:—A parcel of about fifty slides, more or less, was supplied to a dealer from negatives taken in Greece and the Levant by his customer.

After an interval of about twelve months they were returned, with a peculiar effect upon them, as though they had been made on ground glass, or had been coated with matt varnish.

A suggestion was made that imperfect washing was the cause; but this could not be entertained, first, because they were known to have had several hours' washing in a running stream of water; and, secondly, because the heat to which they would be submitted during exhibition would cause any trace of hyposulphite of soda to effloresce, and thus induce a decided opacity, while the mysterious frosting effect was decidedly transparent.

As the result of a consultation, first with two or three lantern experts, and subsequently with two veteran contributors to the photographic press, the conclusion arrived at was that, as the slides were made on Mawson's gelatino-bromide plates, the hygroscopic qualities inherent in a gelatine film had caused them to absorb moisture, and that exhibition in the lantern, and probably long retention therein, had made them so hot as to induce the formation of numerous microscopically minute blisters, suggesting, as above stated, the effect produced by matt varnish.

A remarkable feature of the case consists in the partial character of the effect, as in no instance were the slides entirely frosted, and on looking at them *out* of the lantern their appearance seemed rather improved than otherwise, suggesting an agreeable softening effect on the screen.

Be this as it may, two or three hints may be gathered from the experience.

1. Remember that gelatine is peculiarly hygroscopic, therefore keep all slides in a dry place.

2. Remember that the rays from an oxyhydrogen flame are not only luminous, but calorific, therefore show your slide as short a time as possible, and do not bake them till they blister.

CLOUDS.

By Henry W Bennett.

In photography, equally as in painting or any other graphic art, a suitable and effective sky is frequently the making of the picture. Many landscapes, or specially marine views, are converted from being commonplace and uninteresting into pictorial successes by the addition of striking and harmonious clouds, while a picture that is good in itself is incomplete until they are added, if absent from the original negative.

A guiding principle in adding a sky is that it forms part of an existing picture, of which it is in fact the extreme distance, and the harmony of the composition as a whole must overrule every other consideration. As the general impression of atmospheric effect is conveyed by the more distant rather than the nearer objects, these will in most instances determine the depth to which the sky must be printed; as a general rule, its predominating tone must be lighter than that of the distance, though, where there is any considerable expanse of sky, the upper part may ocasionally be darker, provided that it is lighter as it approaches the horizon.

It is frequently contended, as an absolute rule, that, when clouds are printed from a separate negative, all the data relating to the two must be in perfect agreement. Focus of lens used in each case, direction of light and wind, and time of day must be all the same. From this view the writer very strongly differs. In many cases clouds may be secured on the same plate with a landscape, or be taken separately under identical conditions, and yet appear less harmonious than others printed from a negative in which all the conditions are at variance. In pictorial work the appearance of truth is far more important than the rendering of actual facts, and this applies equally to the legitimacy of adding clouds to a landscape photographed on a cloudless day; if neither the trained artist nor the close observer of nature can see anything discordant in the completed work, the correctness of the method should not be questioned.

A good reason can be urged in favour of taking cloud negatives with a lens of shorter focus than that used for most landscapes. In fine settled weather, that generally chosen for outdoor photography, any clouds that there may be are high, and consequently might be taken with a lens including an angle of about 40° to 45°; but the most favourable opportunities for obtaining cloud negatives are in unsettled, showery, and changeable weather, when the clouds are so low that, if the same lens were used, the individual masses would appear so large that they would be out of all proportion for any ordinary landscape, and the negative almost useless.

Their size, too, would make them appear far too near, instead of giving the effect of the greatest possible distance. Most of the writer's landscapes and marine negatives have been taken with lenses embracing angles of 33° and 41°, that is 14½ in. and 11½ in. focus, for plates 8½ × 6½; while nearly all his sky negatives include 55°, or 8½ lens for the same plate.

The most useful clouds are those ranging from opposite the sun to right angles to it. Those nearer, and especially the very near, are valuable for special, bold, and striking effects, but must be used with the greatest caution.

In obtaining cloud negatives under any conditions, isochromatic plates give immense advantages, with or without a pale yellow screen according to circumstances. Even the most delicate light cirrus clouds, in a clear blue sky, are easily secured without any modification of the normal developer. For Edwards's medium isochromatic plates, with a pale yellow screen, exposures will vary from three seconds with *f*·64 for a bright sky in spring, to as much longer as the conditions, and light, and character of negative desired may require.

Excepting for bold and striking effects, negatives should be thin and full of gradation; a full exposure will secure this result.

ROUND ABOUT THE SUSSEX CHURCHES WITH THE CAMERA.

By Sydney B. Russell.

To those interested in Norman architecture Sussex will be found a particularly interesting county to explore, so many of its churches, especially those in west Sussex, having beautiful examples of Early Norman, transition, and Early English, architecture. If one is limited to a summer holiday of two or three weeks, for exploration in this direction, Littlehampton offers a capital centre of operations, for, besides the host of interesting churches easily reached by road or rail, it offers special attractions in the way of pictorial photography on the banks of that little-known river the Arun. My object, however, is to describe briefly a few of the churches, and the best way to reach them. Clymping is of great interest, as an almost perfect specimen of an Early English church; it is easily reached by crossing the ferry, and a walk of one and a half miles along a very pleasant road; it is cruciform in shape, with a Norman tower at the end of the south transept, and possesses a very beautiful doorway.

Ford church, one mile from here, is very small, with a rude Norman chancel, arch, and font. The latter, I was told, had served for many years as a vessel for cattle to drink from in an adjoining field, but was discovered by accident and dug out, the other portion being found close by. Crossing the railway, and proceeding for half a mile towards Arundel, will be seen nestling among the trees the tiny church of Tortington, and, although its seating capacity cannot exceed fifty people, it is a gem from an architectural point of view, with its richly carved Norman chancel arch and entrance doorway, its imposing Norman font, and traces of Saxon long and short work in the windows and doors. A curiously worded brass is inserted in the chancel arch. Continuing on to Arundel, the church is well worth inspection, its cluster-column pillars, with pointed arches, are singularly beautiful, as is the carved stone pulpit and fifteenth-century font. The beauty of the lofty chancel arch is marred by the ugly brick wall erected by the Duke of Norfolk when establishing his claim to the ancient chapel adjoining, which was the subject of so much litigation.

Lyminster, distant one mile and a half from Littlehampton, has an interesting church, with transition Norman arcade and Norman font. The chancel arch is exceedingly lofty and very narrow, and is claimed to be Saxon work. The keys can be obtained at the Post Office. A walk along the sea front, in an easterly direction, is Rustington, with a Norman tower, transition Norman arcade, some quaint corbels, and a curious squint; the steps leading to the rood loft still remain, and in the lady chapel will be found a monumental slab, of great age and disfigured at the time of the Reformation.

Within easy reach by rail is Worthing, which forms a pleasant day's outing. Broadwater, one mile from the station, is a fine specimen among Sussex churches, with its rich Norman chancel arches and tower. The choir, with old vaulted roof and carved stalls, and a lovely altar tomb to Lord de la Warre, 1526, is well worth a visit, although the clerk lives a little distance away. From here we can walk across the fields to

Sompting, with its curious tower, Saxon so called; certainly it boasts one Saxon window, but its strange outline is more Rhenish than Saxon; inside will be found Norman detail and a very curious corbel; but Sompting has been so much restored that little of the original remains.

We can now take a field path and walk across to Lancing, which has a plain but striking Norman entrance doorway, but little of interest inside, and then proceed to New Shoreham, a pleasant walk, or, if time be of value, train can be taken from Lancing Station. New Shoreham is a gem in Norman architecture; it has an imposing tower, with Norman windows, and the beauty of its interior can hardly be described. The handsome Norman font has been copied for Chichester Cathedral.

Another pleasant day may be spent by starting from Shoreham and walking up the valley of the Adur. Coombe Church is the first we come to, and the leper squint here is worth looking at, as is the rude font. The old parsonage house opposite the church is a very picturesque old building. We next come to Butolphs, an extremely quaint interior, carved pews and pulpit, and Norman chancel arch, and from here a charming walk across the field path brings us to Bramber and Beeding—both worth a visit—and finally we reach Steyning. The Norman arches in the interior are most richly decorated. We can now return by train to Littlehampton, or break our journey at Shoreham, and visit Old Shoreham Church, of great interest to the student of Norman architecture.

Chichester is easily reached from Littlehampton, and a pleasant day can be spent, after looking round the Cathedral, with its early Norman triforium and nave, its carved slabs, brought from Selsey, and of supposed Saxon work, and other innumerable objects of interest, in a trip to Bosham; here the tripod is soon placed in position, and we can after our architectural studies indulge in landscape picture-making galore.

TONING PHOTO-MICROGRAPHS.

By A. J. Banks.

The issue of the Almanac brings with it a reminder that we are now in the midst of the year's darkest days, when, but for the exercise of some hobby, the long evenings would tend to become monotonous and wearisome in the extreme.

To those readers of this weighty volume who devote their leisure time to the fascinating branches of photo-micography, I venture to throw out a gentle hint concerning a toning agent admirably suited to the requirements of prints taken upon gelatino-chloride paper, and which, I believe, is now but very rarely used. I refer to the use of yellow ammonium sulphide.

It gives a range of warm tones, varying from reddish-brown and sepia to brownish-black and grey-black, and for bacterial prints, no matter whether of the organisms themselves or of their colonies, the tone is very pleasing.

The prints should be fixed and washed in running water for five or ten minutes *prior* to toning. A very slight experience will enable the operator to adjust the amount of sulphide required; but, as a guide, it may be stated that one drop of a strong solution per ounce of water will be approximately correct.

The precautions to be observed are to avoid too great an excess of ammonium sulphide, to remove the prints whilst they are slightly lighter in tone than that desired, and, finally, to wash thoroughly.

Yellow ammonium sulphide may be purchased of most dealers in pure chemicals, or it may be prepared by saturating strong liquor ammonia with sulphuretted hydrogen, and afterwards digesting with flowers of sulphur and filtering the liquid. If not required for immediate use, the digestion with sulphur may be conveniently omitted, as the neutral ammonium sulphide is slowly decomposed by the oxygen of the air into ammonia, water, and yellow ammonium sulphide. It should be stored in a well-stoppered bottle. Although it is here specially recommended for photo-micrographs, it is by no means to be despised as a toning agent for ordinary prints, landscape or otherwise. The writer has a collection of views, &c., toned with this agent about three years ago, and not one of which has given the least indication of a tendency towards reaching the vanishing point.

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FRILLING AND ITS PREVENTIVES.

By Matthew Wilson.

Of late years so much has been said and written in regard to frilling, its causes and its treatment, that the subject is now well-nigh threadbare, and it is, therefore with a certain reluctance that, under the above title, I take the opportunity of bringing my own experiences and conclusions before the notice of readers of the Almanac.

At the outset I wish it to be clearly understood that, in undertaking to describe the said experiences, I have been mainly influenced by the consideration that the placing of these on record may act as an incentive to others to take up the inquiries at the point where I lay them down. Such being the scope of my article, it will be understood that any remarks hereafter made under the head of treatment—so far, at least, as these possess any novelty—must be regarded more as recommendations as to the line in which experiment may be profitably pursued than as fully matured rules suitable for general adoption in practice.

As to the causes of the phenomenon technically known by the name of frilling little need be said, as they are at the present day sufficiently well known. However much we photographers may differ as to their order, importance, and influence, we are, I think, agreed as to their number.

Five causes are commonly mentioned as contributing towards this evil. First of all, we have the gelatine medium itself. Commercial gelatines differ greatly in the matter of hardness. Generally speaking, the coarse and less refined varieties possess greater tenacity than do the pure. On this account, the gelatines that are usually preferred for plate-making purposes are those of a more or less soft description. Frequently, indeed, they are found too soft for use, and, by way of compromise, the plate-maker has to employ a mixture of different kinds, constituting a sort of compound gelatine.

Frilling is apt to occur in all cases where soft gelatines have been exclusively employed. Several of the best and most celebrated brands of commercial plates now in the field exhibit this defect in a very marked degree. Others, again, of a decidedly inferior character are found to be faultless in this respect.

Heat is an almost equally important cause of frilling. We are all, doubtless, familiar with the difficulties and discomforts experienced during development in warm weather. Not the least of these is the difficulty of preserving the film in an intact condition. The third cause of frilling I take to be the presence of an excess of alkali in the developer, or the employment of alkaline solutions in an unduly concentrated form. Strong alkalies act as solvents upon the gelatine of the film, and thus help to effect its disintegration. Fourthly, when it is found necessary to prolong the process of development beyond the ordinary stage, frilling is likely to result. Fifthly—and lastly—this defect is as often as not due to the friction to which the gelatine film is subjected during the processes of development, fixing, and washing, but particularly the last-named.

The causes being disposed of, we have next to consider what remedies are available. In the first place, we have the time-honoured alum bath. Practice—our guide in these matters—prescribes this remedy, and we are accordingly content to accept it, less perhaps on account of its actual merits than from the fact that we are unwilling to seek for a substitute. Prevention, however, is admittedly better than cure. Now, our object being to prevent frilling, we cannot attain it by means of the alum bath, for that, strictly speaking, is rather a remedy than a preventive. I have already indicated that several of the causes which exercise a destructive influence on the film are operative during the process of development. Since the alum bath comes into play at a later stage in the proceedings, *i.e.*, either before or after fixing, the chances are that, even under the most favourable circumstances, its action will only partially undo the mischief that has been effected elsewhere. It is evident, therefore, that any treatment for frilling, to be truly preventive in character, must be applied either previous to, or during, the development.

Whilst lately engaged in a series of experiments undertaken with the object of finding a substitute for the alum bath, I availed myself of the opportunity thus afforded me in seeking to determine whether or not a solution of tannic acid was capable of acting as a frilling preventive. The hardening action of tannic acid upon gelatine must be familiar to all. On the large scale, the peculiar properties of this substance are successfully utilised in the process of tanning. Thinking that they might also be turned to account for purposes of photography, I began my investigations.

The following freshly prepared solution was employed to harden the film previous to development:—

Tannic acid	27 grains.
Water	1 pint.

The exposed plates were immersed in this bath from three to four minutes, removed, well rinsed with water, and transferred to the developing dish. The pyro and ammonia developer was employed, and the duration of development varied from three to five minutes. On removing the plates from the developer, the surface of each film was found to be considerably stained, but no signs of frilling could be detected. They were then fixed and washed in the usual way. Owing to the resistance offered by the hardened gelatine, the time devoted to the operation of fixing had to be slightly increased. Though the washing process was carried out without special precautions, no frilling made its appearance.

Unfortunately, the negatives so produced were found to be faulty. Stains which, viewed by transmitted light, showed as large irregularly circular dark-coloured patches, were visible at several points on the surface of the image.

Evidently, therefore, serious objections could be urged against the tannic-acid treatment previous to development. To ascertain if the same objections would apply under circumstances where the treatment was somewhat varied, I prepared the following solution:—

Tannic acid	40 grains.
Water	10 fluid ounces.

To every two ounces of pyro and ammonia developer employed I added one ounce of this solution. As soon as the mixture was effected, the exposed plate was immersed in the developer. The development was completed in nine minutes' time. During the process a thin, cream-coloured deposit or precipitate was formed on the surface of the film. This deposit did not, however, at all interfere with the action of the developer, and after development was easily removed by washing. When the plate was transferred to the fixing bath, the pale yellow colour, characteristic of unaltered bromide of silver, was very apparent in the shadows and half-tones of the negative.

To ensure perfect fixing (indicated in this case by the disappearance of the last traces of bromide at the margins), the time ordinarily devoted to this operation had to be doubled.

So far no frilling had manifested itself. The plate was next washed in a strong current of water. This washing having failed to produce frilling, the film was washed a second time in a current of increased strength and volume. Water was now played continuously upon the margin of the plate. This time faint signs of frilling began to appear, and small flakes of gelatine were splintered and loosened at certain points along the edge of the film. The disintegration thus effected remained, however, purely local, though pains were taken to afford it full opportunities for spreading.

The resulting negative was of a highly satisfactory character, and was particularly remarkable for the qualities of clearness and contrast. No stains could be discerned when the image was viewed by transmitted light, and the printing qualities of the negative left nothing to be desired.

The experiment just described may be regarded as typical, and will, I think, sufficiently well serve to show that the tannic-acid treatment during development is not unworthy of the attention of practical photographers.

I have not tried the effect of combining the tannic-acid bath with a carbonate developer. It is possible that the preventive action of the acid might be exerted to better purpose in the absence of an alkali.

Further experiment will enable my readers to determine this point for themselves.

The standard tannic-acid solution will keep for two or three weeks. It should, however, be used as soon as possible, as, when once it has turned brown, stained negatives are likely to result. The strength of solution that I have given is well suited for experiments in warm weather, and with developers containing alkali. A weaker solution may be employed in cold weather.

To prevent staining, care must be taken not to rub the surface of the film previous to fixing. A little practice will be required to produce uniformly good results.

VARIOUS NAMES OF CERTAIN CHEMICALS.

By J. Barker.

This Almanac being a work of reference for photographers, the following list is offered in the hope that it may be found useful:—

Common Name.	Chemical Name.	Druggist's Name.
Aquafortis	Nitric Acid	Acidum Nitricum
Alum	Potassic Aluminic Sulphate	Alumen
Bluestone Blue Vitriol	Sulphate of Copper	Cupri Sulphas
White Vitriol	Sulphate of Zinc	Zinci Sulphas
Oil of Vitriol	Sulphuric Acid	Acidum Sulphuricum
Green Copperas	Sulphate of Iron	Ferri Sulphas
Zinc White	Oxide of Zinc	Zinci Oxidum
Butter of Zinc	Chloride of Zinc	Zinci Chloridum
Sugar of Lead	Lead Acetate	Plumbi Acetas
Stone Hartshorn	Carbonate of Ammonia	Ammoniæ Carbonas
Sal Ammoniac	Chloride of Ammonium	Ammonii Chloridum
Caustic Potass.	Hydrate of Potass.	Potassæ Caustica
Salts of Tartar Pearlash Prepared Kali	Carbonate of Potass.	Potassæ Carbonas
	Oxalate of Potass.	Potassæ Oxalas
Salts of Sorrel Essential Salt of Lemons	Binoxalate of Potass.	Potassæ Binoxalas
Sal Polychrestum	Sulphate of Potass.	Potassæ Sulphas
Sal Enixum	Bisulphate of Potass.	Potassæ Bisulphas
Liver of Sulphur	Sulphide of Potass.	Potassii Sulphuretum
Saltpetre Nitre	Nitrate of Potass.	Potassæ Nitras
Chili Saltpetre	Nitrate of Soda	Sodæ Nitras
Lunar Caustic	Nitrate of Silver	Argenti Nitras

Common Name.	Chemical Name.	Druggist's Name.
Corrosive Sublimate	Bichloride of Mercury	Hydrargyri Perchloridum
Carbolic Acid	Phenol	Acidum Carbolicum
Spirits of Wine	Alcohol	Spiritus Rectificatus
Spirits of Salts	Hydrochloric Acid	Acidum Hydrochloricum
Vinegar	Acetic Acid	Acetum
	Glacial Acetic Acid	Acidum Aceticum Glaciale
Water	Oxide of Hydrogen	Aqua
Chalk	Carbonate of Lime	Creta
Tannin	Tannic Acid	Acidum Tannicum
Gum Arabic		Acaciæ Gummi
Gum Thus Frankincense		Thus Americanum
Gum Tragacanth		Tragacantha
Balsam of Fir Venice Turpentine		Terebinthina Veneta
Canada Balsam		Terebinthina Canadensis
Guaiacum		Guaiaci Resina
Colophonium Resin		Resina

HOW I MOUNT MY P.O.P.

By J. W. Parratt.

As the Almanac is read by beginners as well as the old hands, I think a word or two on the mounting of P.O.P. will not be out of place. I have used the paper for two years, and during that time I have tried a good few of the advertised 'mounting mediums,' and I prefer a gelatine solution. The mounting of gelatino-chloride paper should be an easy matter if only users would be more careful. My method is:—After I have toned and fixed my prints, I wash them in a lavatory basin for about an hour in running water. I then take them and lay them on some clean blotting-paper (which has not been used to blot with, as it will mark the prints) to remove the superfluous water. I then lay them face downwards on some of the oiled tissue in which Ilford P.O.P. is sent out. I always save this, as it is useful for a number of purposes. After I have done this, I blot them again before I apply the mountant. When the mountant is melted by being placed in a jar of hot water, I apply a thin coating to the back of the print, and then place it on the mount. Here again the oiled tissue comes in. I lay it over the surface of the print, and squeegee it, and the mounted prints are put to dry. With a little practice, prints any size may be mounted in this way. Prints that have been glazed on glass have always proved to take a lot of trouble to mount, as the glass is so easily affected by finger marks and anything coming in contact with it. If I have made the process of mounting any easier for my photographic friends, I shall be satisfied.

BACKING PLATES.

By T. W. Derrington.

How many who read this ever systematically back all the plates they expose? And yet how often is it recommended. Some photographers seem to imagine that only plates used for such work as interiors need be backed. I think if they will only try the experiment they will be so satisfied with the results that they will never expose another unbacked plate whatever the subject. The gain in crispness and the absence of that slight halation which often is overlooked is remarkable. Of course, the 'new' school will prefer their plates unbacked, as fine 'effects' can be obtained, such as 'atmosphere' &c.

Now, a backing to be of any good must be of the same (or nearly) index of refraction as glass, otherwise it is useless. The substance most easily obtained and which answers the requirements perfectly, is caramel. It is easily made or bought, and the backing mixture is very little trouble to compound.

The formula I have used myself for some time and with uniform success is:—

Caramel		1	ounce.
Burnt sienna or	dry	1	,,
Lamp-black		¼	,,
Water		2	ounces.
Methylated spirit		2	,,

Dissolve the caramel in the water, add the finely ground colour and then the spirit, shake well before use.

It is applied by saturating a small sponge and dabbing the back of the plate. The merest film is sufficient and it then dries in a minute or two. In backing half a dozen plates, the first is ready for the dark slide before the last is finished, so that there is no trouble with plates lying about to dry.

PRACTICAL HINTS ON TONING GELATINO, COLLODIO-CHLORIDE, AND OTHER PAPERS WITH THE SULPHO-CYANIDE BATH.

By J. H. Smith.

I am again reminded, on receiving a letter from the Editor, that the Almanac for 1896 is in active preparation, and that something practical would be acceptable for its pages. I do not think I can do better than give a few hints on the every-day working of the above papers. I think the formulæ issued by the makers for toning with the sulphocyanide bath too strong in that salt. Better results are to be obtained in every-day practice by using a weaker bath. One I find excellent is as follows: Sulphocyanide, 15 grains; water, 20 ounces. With this bath the toning is not too rapid, and the prints more even in tone. One peculiarity about toning with the bath strong in sulphocyanide and gold is that the first few prints toned will, although taken out at the right depth of tone, still go on toning, although put into salt and water to stop the action, and when fixed be of an unpleasant pinky colour. I have no doubt whatever that the best results are to be obtained, as to evenness of tone and prints more like our old friend albumen, with a combined toning and fixing bath; but, as many of our best workers in the profession condemn this system of working as not being permanent, no doubt it would be wise for all those who aim at turning out their work as permanent as possible to discard this way of working. I myself have prints toned on both P.O.P. and Solio with the Eastman Company's combined bath which have been done eighteen months, and which show no signs of discolouration in the whites, neither fading, although subjected to strong sunlight for several months in show-cases. It is better, perhaps, to make a fresh bath of sulphocyanide for every day's toning. The salt being very cheap, it is false economy to use it more than once. All old baths can be added to the residues, and any gold precipitated by adding a solution of sulphate of iron.

A great deal of the want of permanency in prints on gelatine, I think, can be traced to the use of alum; and, if used at all, the washing after should be most thorough to get rid of every trace before toning. Now comes the important question, Has gelatine replaced albumen? I think, up to the present, the answer is No. Until a toning bath is found that will not give double tones, I think albumen will hold its own. The greatest rival albumen has to contend with up to the present is collodio-chloride paper, the only drawback to its use being its liability to crack during the washing operations. For pureness of whites, delicacy of tone, and simplicity of working, with no double tones, I think it stands unrivalled; and, if the defect I have mentioned can be overcome, collodio-chloride will take the lead, and displace both gelatine and albumen.

All toning baths for emulsion papers are not so reliable and simple to work as the acetate of soda bath of old; but, as emulsion papers are, as it were, in their infancy, a wide field is open to experimentalists as to a suitable toning bath for these papers, and, no doubt in the near future, we shall be rewarded by some gentleman making known to the profession at large a standard toning bath for every-day use for these papers, as the formulæ now issued are very unsatisfactory.

HALF-TONE WORK FOR AMATEURS.

By W. A. Whiston, F.C.S.

How I came to take it up was just this: I had many photos by me, and had invested in a small printing press, and so sought the "missing link" between the camera and the printing press. With my printed matter, I had sent bromide prints until weary and dissatisfied, and was about to invest in the "autocopyist," when an article on half-tone work caught my eye; the process took my fancy, and I set about the matter in good earnest. I got help and went into the matter thoroughly, and was infatuated by it. Like all things photographic, photo-mechanical processes are rapidly improving and becoming simplified; and now I wish to briefly indicate a course which may safely be taken as a basis for experiment.

Object.—To render a picture, with a hard-printing surface which must be "broken up," and of such a nature that the printer's roller will leave its ink in quantity proportionate to the lights and shadows of the original.

Screen.—To produce such a surface, a negative is taken, behind a screen made of black lines some 100 to 133 to the inch, and ruled crosswise, at right angles. The screen (5 × 4 costs 12s. 6d.) is placed at from $\frac{1}{16}$ to $\frac{1}{30}$ of an inch in front of the sensitive plate, and breaks up the picture into dots and squares. This action is peculiar, and many theorists have tried to account for it. It is not within our province to discuss the theory; suffice this, the half-tones of the original copy should be reproduced as perfect black and white squares, practically the same as an ordinary chessboard. There are several factors that must be remembered in seeking for this chessboard effect; first a square stop ☐ must be used, its sides at angles of 45° to the lines of the screen; secondly, the stop *f*-16 is the best ratio to start work from, *i.e.*, a stop whose diameter is $\frac{1}{16}$ of the length to which the camera is racked out when copying the picture; thirdly, a rapid rectilinear lens, of good depth of focus is necessary; fourthly, a bright light on the copy; fifthly, the screen must be the right distance from the sensitive plate; and, sixthly, a full and sufficient exposure must be given.

Plate.—Many have asserted that wet-plate negatives will alone give the necessary effect. This is no longer the case; with the Ilford process plates I have seen results not to be surpassed. A point to remember is this, it is not necessary to have a *brilliant* negative; success depends solely on the *shape of the dots*, provided, of course, the negative is not too thin for printing. An apparently poor negative, altogether devoid of contrast, may prove an ideal one, because it has dots of the right shape, *i.e.*, chessboard in the half-tones, white dots in the highest lights, and black dots in the shadows; and is with this, opaque.

Formulæ.—These now are many, and will, doubtless, increase as time goes on. The "fish-glue formulæ" are perhaps as popular as any, and one may turn to any photographic paper now to gather a good one.

Printing on Copper.—Though a trifle more expensive than zinc, I should recommend copper for the amateur to experiment with. Clean your copper with powdered pumice and water, and wash well; then coat with enameline solution, and dry as quickly as possible over the gas. Then place the copper with the negative in a *strong* printing frame, and screw them down until iridescent rings appear through the glass. Printing may take from two to twenty minutes; to judge of this, an actinometer may be used. To make this—place in a quarter-plate printing frame varying thicknesses of paper—say ten—and number them, and behind this place some gelatine chloride paper, noting the tint at a given number, when taking the copper plate out of the frame. Now place the copper in a dye (eosine 2 drachms, water 10 ounces) to enable you to judge of the washing. The sensitive solution (bichromated gelatine) on the copper has this property, where affected by light, it *becomes insoluble in water.* Thus, in the high lights, the thin dots on the negative will only allow white dots to be affected, whereas in the shadows all will be affected save where the small black dots are manifest in the negative. Now, we start to wash the plate in cold water, if necessary using warm, or even hot, in order to wash out the gelatine from the comparatively large spaces in the high lights, &c., and this must continue until we get bare copper in all parts represented by the opaque parts of the negative. This done, the copper must be heated until the fish-glue solution becomes an enamel and generally shows a silvery whiteness. Before this transpires, the dye is driven off by the heat, and this itself warns the operator to be on the *qui vive.* This done, the plate is covered at the back, edges, and sides, where not required to be etched, with a varnish of shellac and methylated spirit. A part of this is scratched away to enable the depth of the etching to be felt with the thumbnail, and the plate then placed in a solution of iron perchloride, the strength varying with the depth or fineness required. It may be taken out and examined any time, or a rough proof may be pulled by a neighbouring printer, and the etching continued, if necessary.

Finishing.—Though mounting is not difficult to accomplish, I should recommend the amateur to send his plates to a trade mounter, as it is much more satisfactory.

My paper has been hastily thrown together, but, if it has the result of encouraging any amateur photographer to investigate and experiment for himself, I shall have attained my end.

OVER-EXPOSURE AND ITS TREATMENT.

By G. G. Mitchell.

At the present time there is a strong desire to have plates of a high speed, and makers accordingly vie with each other in meeting the demand. Rapidity, indeed, advances by leaps and bounds. A circular before me intimates, for instance, that a certain plate is now made with an increased speed of sixty per cent. A very rapid plate, when really necessary, is a most valuable thing, and we may count ourselves happy, and richly blessed beyond our photographic fathers, that we can command it; but, at the same time, it is not the best to be used on all and every occasion. In fact, it is folly to use it when speed is of little or no consequence, because the very quality which renders it a perfect success in some exceptional instances is apt to bring nothing but disaster and complete failure to the sanguine user.

There can be no doubt whatever that a very large percentage of waste both of good material and human energy, results from the too prevalent use of high-speed numbers, in combination, to a large extent, with exposures which belong to smaller stops and slower plates. Very fast emulsions are not amenable to the same facility of successful treatment as slower makes, and therefore there is always more or less of a hazard in development, even in experienced hands. It is a comparatively easy matter to manage over-exposure in an ordinary plate. The usual sign of 'flashing up' suggests at once a prompt rinsing under the tap, and, according to the extent of the evil, liberal treatment with bromide, perhaps soaking the plate in a solution of it for five or ten minutes before again proceeding with a modified developer, in which restrainer and pyro are strong features.

Some years ago Mr. W. J. Harrison recommended citrate of ammonia for over-exposure, and every landscapist, at least, should have it in his dark room. Its action is decided, and many a picture, which would be hopelessly spoiled if developed in the usual way to the bitter end, could be saved if judiciously treated by its aid. A ten per cent. solution of it, kept ready for emergencies, will be found useful, either employed as an adjunct to the usual developer in such degree as experience may dictate, or used simply by itself, to flood the afflicted plate after rinsing, will often work wonders; but one must be quick in such circumstances, for even a pretty strong rush of water does not prevent development going on, and the sooner an efficient retarder is applied the better. Some fast plates, under these circumstances, will be found unmanageable, and a normal image altogether beyond recall. No one with the slightest suspicion of over-exposure should use other than a weak developer to begin with till it is seen how the land lies, and then proceed with caution.

Sometimes it will be better to stop development much short of proper density, and fix the plate with a view to its subsequent intensification, that alternative being judged preferable to a probable want of contrast. Every case presents its own merits for consideration.

LEVELS AND BACKING OF PLATES.

By A. Brooker.

One of the most important adjuncts of a photographer's outfit, too often neglected, is a good spirit level, which should not only be provided, but, as is not always the case, used, on every occasion when the camera is set up. For small cameras, those which are generally sold are too large to be affixed to the swing back without interfering with the movements of the camera, and, as a perfect level should work both ways, horizontally and vertically, a pocket or loose one is much preferable, of the square form, so that one of the sides, being at right angles to the flow of the air bubble, and placed against the focussing screen, shall act as a plumb, as well as a horizontal level when placed on the top of screen.

The days of drunken or inebriate distortion are nearly numbered with regard to architectural subjects, although they still appear quite frequently enough in every-day work, and even in process blocks selected for journalistic illustration, to justify what to some may appear a 'vain repetition' of a stale subject. Only a short time ago the writer had his attention drawn to a specimen of this convergence of parallel lines in the form of an enlargement in an architect's office, the long-suffering owner of which mentioning, with a sigh, that the bill for them (a dozen or so copies) came to 18*l.*, which was duly, but rather foolishly, paid, and then all the enlargements, but this one specimen, torn up. The drunkenness in a building, of course, is self-evident to any one who can see straight, but how often are the same errors perpetrated in landscape and many other forms, in which the critic would not notice the distortion unless he were acquainted topographically with the subject; as an instance how easy, by an improper use of the swing back, to render what should be down-hill as quite a steep climb up! I remember once rallying a professional photographer on his want of *uprightness* in a particular example of architectural work, and to account for which he libelled a most eminent firm of lens-makers by suggesting it was caused by some occult property of the lens. Finding this was of the usual rapid rectilinear type, I ventured the remark that it was the '*swing back*,' and, although some few years ago, I have hardly yet recovered from his reply that 'it could not be that, as his camera had not got one.'

In stereoscopic photography, justly becoming again so popular, a level, more particularly for horizontal levelling, is absolutely necessary, and this brings me to my second part—

The Backing of Plates.

Any one who practises making stereographs will soon find out that any hardness or blocking up of the high lights is fatal to good work in this branch, and that the slightest trace of halation in the negative should at once ensure its consignment to the great majority. By backing the plates, and of course taking the usual precautions in development, soft, delicately graded negatives, without any trace of hardness or halation, may be secured. To go farther, all plates should be *properly* backed (paper gummed on is of very little use), and those who wish to produce perfect lantern slides by contact printing, and particularly by reduction, should, if they do not already do so, try for themselves the improvement in results effected by backing their lantern plates.

TONING.

By Wilfred Emery.

I propose this year giving the readers of The British Journal Almanac a formula for toning P.O.P. which I have found to give excellent results. Many workers in our art-science prefer to use a separate toning and fixing bath, but object to the tendency to double tones which frequently result from using the sulphocyanide bath (30 grains sulph. amm. to 2 grains gold). The bath I am going to recommend does *not* give double tones, so far as I can discover, under any conditions; at the same time, either *warm* or *cold* tones can be obtained at the pleasure of the operator. As we most of us know to our cost, the attempt to get *warm* tones with the sulphocyanide bath usually results in such a very nasty colour that we have perforce been compelled to have cold tones, or else use the much-maligned combined toning and fixing bath. Personally I think that the permanency of the finished pictures depends less on the bath used than it does on the carefulness and brains of the user. As far as time and my experience goes, I have found pretty equal permanency, or the want of it, with either form of bath. Any picture on a gelatine basis will, under sufficiently detrimental conditions *after* it is finished, show signs of change. As we all know, damp and smoky rooms, bad mounts, &c., all have a bad influence on a gelatinous picture.

But to return. The formula I recommend is:—

Acetate of soda	84 grains.
Sulph. ammonium	28 ,,
Sulphite soda	3 ,,
Gold	2 ,,
Water	16 ounces.

This bath should be mixed several days *before* using, and should be used over and over again. It works better after it has been used, and improves by using. Make up two baths. Keep one for a stock bath, and, as the working bath gets weak, strengthen by adding from the stock. The method of toning is that usually recommended with the sulphocyanide bath. Well wash the prints in several changes of water (if the weather is very hot, it may be necessary to use the alum bath, in which case well wash afterwards before toning). Then pass the prints one by one into the toning bath until you have about twenty in it; keep them constantly moving, and tone until the *surface* of the print is somewhat colder in tone than you wish the finished print to be. Remove the toned print to a dish of clean water. Have the three dishes in a row, and as you take a toned print out of the toning bath with one hand pass a fresh print from the washing water into the toning bath with the other. Thus you will keep twenty prints in the bath *all* the time you are toning, which you will find a great saving of time. When all the prints are toned, give them two or three changes of fresh water, and then place in the fixing bath (4 ounces hypo to 1 pint water) for ten to fifteen minutes. Then wash in constant changes under running water for an hour or so, and mount in the usual way. Of course, absolute cleanliness of hands, dishes, &c., and constant movement in the different solutions, is essential to success. The great advantages of this bath are freedom from double tones, and the power of getting a rich, brilliant, warm tone if desired. I hope those of my readers who have had any difficulty in either of these respects will give the bath a careful trial, and I feel sure they will like it. Remember an *old* and used bath works better than a *new* one.

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COUNTY DONEGAL AS A FIELD FOR THE PHOTOGRAPHER.

By Harry Selby.

As there is at present a decided move in the direction of attracting tourists to Ireland, it may not be out of place to say a few words in the ALMANAC as to the attractions for the photographer in the large north-western county of Donegal. Those who are in need of detailed information cannot do better than procure Baddeley's invaluable *Guide to Ireland, Part I.*, in which is a large section devoted exclusively to this portion of the country. The particular attractions are, without doubt, the very fine and grand cliffs, both in the peninsula of Horn Head and in the long stretch from Slieve League northwards to Slieve Tooey. The highest points of cliff at Horn Head are at the Horn itself, which rises nearly sheer 626 feet, while in the westerly district between Slieve League and Slieve Tooey they rise to 800 feet sheer at Tormore Head. These heights, great as they are, are very greatly eclipsed at Slieve League, where the cliffs rise from the waters of Donegal Bay at a steep angle to the enormous height of 1970 feet.

Of mountains in the county there are several which call for attention, but the most noteworthy are undoubtedly the range which, starting with the straight-backed Muckish, ends very finely with the exquisite white cone of Errigal. The latter, which falls steeply into the waters of Dunlewy Lough, is a very fine feature in the wild district of Gweedore, and for tourists it has the advantage over its neighbours of being near the excellent modern Gweedore Hotel. This hotel is a capital centre, as within easy distances from it are the above-named Errigal, the two Loughs Nacung and Dunlewy, the beautiful river Clady, the Poisoned Glen—all on the eastern side of the hotel, and on the western side the coast of the Atlantic, with the villages of Bunbeg and Derrybeg.

A good starting-point for a trip to the County Donegal is Londonderry, whence the beautiful Lough Swilly is only a few miles distant by narrow-gauge railway. Buncrana is a capital place for 'negotiating' the Lough, which is famous for its sunsets. There are other places with good hotels on the Lough, notably Portsalon, for those who have time. Horn Head is attacked from Dunfanaghy, near which town are some very fine sand dunes, which rise at least 200 feet from the inlet. Dunfanaghy is easily approached from Derry or Buncrana by means of the narrow-gauge line to Letterkenny, whence either the mail car or the 'long car' may be taken. But for those who prefer to walk it is a fine tramp of some twenty or more miles from Letterkenny *viâ* Glen Village. From Dunfanaghy, Gweedore may be reached by mail car, and very fine views of Errigal Mountain are obtained during the latter eight or nine miles of the drive. The attractions of Gweedore have been mentioned already. From Gweedore it is a long drive *viâ* Dungloe (where a fine inlet offers great possibilities for sunsets and fishing) to Finntown Station, whence train can be taken by the Balfour line to Glenties, six miles from which town is Ardara.

Before reaching this point, however, it is necessary to mention Doochary Bridge, a very lovely spot, whence the famous Lough Veagh and Glen Veagh are easily reached. Unfortunately, Doochary Bridge has no hotel, but merely a small inn or two, consequently the Glen Veagh district is more simply approached from Letterkenny, where there is a good hotel.

Ardara, where is a capital hotel, is, in respect of its position at the head of the twin bays of Loughros Beg and Loughros More, a perfect paradise for the photographer. I know nothing personally of the latter bay, but of the former I can say that I know of no inlet anywhere which offers such attractions to the photographer. When the tide is out, the views of hills, water, and sand are exquisite, and at the tiny village of Maghera the sands and sand dunes are wonderful. Here, too, 2000 feet above the sea, which washes its base, is the giant Slieve Tooey, with its tremendous cliffs and its nest of eagles. Those who can walk and climb will find a walk from Ardara, via Maghera, Slieve Tooey, and the coast, to Glencolumbkille and Carrick—some twenty odd miles—which will try the powers of endurance of the toughest. Those who are unable or unwilling to cope with such a task can drive or walk to Carrick, and attack the wonderful piece of coast from this place, where is an admirable modern hotel.

From Carrick a walk of six miles or so brings one to Glencolumbkille, a small, quite Irish village, sacred to the memory of St. Columb. After all one hears of the place, it is about the greatest fraud in creation; but it is close to Glen Head, a sheer precipice of 600 feet, which is the first point of interest in as fine a piece of coast as the British Isles can show.

Close beyond Glen Head is the Sturrall, a razor edge with a craggy top, a really terrible looking piece of rock. A couple of miles beyond the Sturrall is Tormore Head, 800 feet sheer, and further on, blocking the view of Loughros Beg Bay, is the mighty cliff of Slieve Tooey.

The giant of Carrick, however, is Slieve League, and no one should leave without climbing it *viâ* Bunglas. It is a splendid climb, culminating in a razor edge known as the One Man's Path. I confess that nothing short of absolute compulsion would induce me to tackle this path, and it was only the possibility of circumventing it that enabled me to gain the summit, which is at the edge of a grand precipitous piece of rock. It is something to stand at the summit of a cliff 1970 feet in height, and to gaze down at the waters of the Atlantic dashing at the base. A short and very easy descent to Carrick is made by a road nearly the whole way down.

An easy walk from Carrick brings one to Killybegs, a small town with a delightful position on a bay, and from thence a short ride on the Balfour Railway takes one to Donegal, equally delightfully situated on an inlet of Donegal Bay. From here a walk or railway ride to Stranorlar about completes the circuit of the county. The walk to Stranorlar is to be preferred, as it enables one to visit the lovely Lough Eske and to explore Barnesmore Gap.

In following the route I have thus roughly marked out, the visitor need not fear anything in the way of dirty or unsatisfactory hotels. Some are first class, and some delightfully simple, but perfectly satisfactory. In every one where I stayed there was cleanliness and comfort, and nothing more surely is necessary.

EGYPT.

By E. R. Ashton.

The month of February last gained a somewhat unenviable notoriety for its inclemency, and many would doubtless gladly have exchanged its rigours for cloudless skies and a shade temperature of 90 degrees and upwards, but withal of such extraordinary dryness as to bring with it no sense of oppressiveness.

The Indian Mail to Brindisi and P. & O. steamer to Alexandria enable us in one short week to reach this favoured land; although in the interests of economy the somewhat longer route by French steamer from Marseilles has its advantages.

In Egypt one becomes, almost of necessity, a Cook's tourist, in the sense that travelling facilities on the Nile are mainly in their hands. Of their two services, the Post boats are to be preferred to the special tourist steamers, as presenting greater opportunities of securing pictures of native life. Hotels with every comfort are to be found at Luxor and Assouan, though somewhat crowded in February.

Egypt is at once the delight and the despair of the photographic enthusiast. The ability to reproduce the intricate details of Eastern architecture is of the greatest value; one's æsthetic sense is, however, so overwhelmed with the glorious colouring which is such a constant charm to the eye that a monochrome reproduction of the scenes around one is apt to be somewhat disappointing.

The delightful pictures of native life in the bazaars are also almost beyond one's reach. These hives of industry are all roofed over, and the cool shade is assiduously cultivated. Quiet courtyards may, however, be found, and, with somewhat lengthy exposures, something of the picturesqueness, at least in form, of Eastern life may be secured.

Village life can be studied to advantage in the neighbourhood of the Pyramids, with the excellent Mena House Hotel as headquarters. The primitive native methods of cultivation and irrigation will be found of great interest, and the unceasing struggle between the whirling sand of the desert and the cultivating influence of the Nile inundation may be noted. The palm, and the camel also, which play so large a part in Eastern landscape, are here especially noticeable.

From a technical point of view, cut sheet films are of great advantage where long distances have to be traversed. The extreme dryness of the atmosphere, however, creates a tendency to curling, and the use of film-carriers is advisable. In the case of subjects lighted by the direct rays of the sun, comparatively long exposures are advisable, in order to introduce some transparency into the otherwise intense blackness of the shadows.

MULTIPLE FILMS.

By Geo. H. Gardner.

In view of the success which has been achieved by the introduction of multiple-coated plates, and to the fact that their use is now becoming general throughout the photographic world, a few suggestions may not be out of place to those who have not yet had an opportunity of becoming familiar with their many advantages. I may fairly say, in the words of a now famous soap advertisement, 'that since using the above I have used no other,' a fate which is likely to befall any of my readers who may be tempted to experiment in this direction.

Professor Burton and other scientists have already demonstrated in the photographic journals how, by a straight line, A B, and a wriggly line, C D, multiple-coated plates *must* be the best. How it's done is 'one of those things which no fellah can understand,' but the result arrived at is beyond question. They are plates which will enable any one, whether amateur or professional, to produce pictures with certainty. Their tremendous latitude of exposure, rendering of colour, and softness of gradation are simply marvellous, while halation is practically eliminated. If users of single films are inclined to be incredulous as to these qualities, let them closely scan specimens of work done upon these plates which are reproduced in the present volume. The rendering of the detail of a stained-glass window, with exposures of one minute and fourteen hours respectively, is something which may well cause the devotee of single-coated plates to marvel muchly. The pictures speak for themselves, and to the veriest tyro in photography further comment is superfluous. The Pyx Dinner at the Goldsmiths' Hall is another illustration —if further illustration is needed—of what plates of this sort can do.

The exquisite rendering of the napery and table decorations, and of the glass lustres of the candelabra; together with the detail in the shadows, the perfect gradation, and the well-balanced relief, go to make up a *tout-ensemble* which any one will freely admit it would be difficult to produce by any other known means.

The average worker, while appreciating all this, is frequently deterred from using these plates by the fear that such results can only be obtained by intricate manipulation of a character far beyond his skill. So far from this being the case, however, any one can obtain equal results with almost mechanical certainty if attention is paid to two points. The first is, Give ample exposure; as even multiple-coated plates will not yield an image which has not been fully impressed upon them. For the second, use a very weak and well-restrained developer, and prolong the development accordingly. Any developer will do, but the inventor, Mr. Sandell, always uses metol; and he is most likely to know what is best. His formula is delightfully simple:—Use a well-restrained developer of a quarter the normal strength; immerse the plates for half an hour, and your pictures are finished. Any number of plates can be developed in the same batch, the only limit being the size of the dish. Half an hour may seem a long time; but when several plates are developed together the process is much more expeditious than by the ordinary method; and any one who is unable to carry out such simple instructions as these may as well throw photography to the dogs.

COPYING AND VIGNETTING OUT AT ONE OPERATION.

By J. Leisk.

Photographers are frequently requested to copy out one figure from a photographic group, and possibly asked to enlarge the same in the process. The expedients for blocking out the surrounding figures, &c., of the group are various, and some of them are troublesome, requiring skill to ensure success, while the process I am about to describe is simplicity itself, is effective, and can be made to give artistic results.

I will presume that the photographer has, for copying purposes, a board on which to screw the camera, with a sliding upright piece near one end on which to fasten the photograph to be copied, and I will further suppose that the group photograph, from which a figure is to be copied, is pinned in position on the latter, the selected figure being directly opposite the centre of the lens, the distance adjusted to suit the size of the copy required, and the image carefully focussed, when, on examining the ground glass, the centre will be occupied by the selected figure, surrounded by the others in the group; and now for my blocking-out and vignetting contrivance:—

Procure a piece of thin board, about the size of the camera front, and on one end, at right angles, nail a smaller piece on which it may stand upright on the copying board, place it in front of the camera, and, exactly opposite the lens, mark out, and afterwards cut out, a hole about the size of the lens hood; next cover the side *next* the camera all over with a piece of white cotton-wool wadding, attaching it by a tack at each corner, and then, over the hole in the board and *exactly opposite the centre* (which should correspond with the centre of the lens), pluck away the wool bit by bit until a small hole is made *surrounded by a fringe of the wool hairs.*

The above is now replaced between the lens and the picture, and moved to and fro until just as much of the selected figure appears on the focussing screen as is desired, when, if the opening in the wool is of the right size and shape and properly adjusted, the ground glass will now show the central figure softly vignetted off to pure white at the margin; no details of the wool screen will appear, the surface being fluffy and also out of focus. The exposure is now made, and the resulting negative developed to average density will yield softly vignetted prints by plain printing out without further trouble.

I cannot say whether the foregoing idea is original, but it is so far as I am concerned, and consequently it may be new and useful to others, which is my excuse for offering it to the readers of the Almanac.

IN THE SERVICE OF ART.

By F. Wilcockson.

One of the greatest uses of photography to the painter should be in providing him with data from which to paint action, but up to the present he appears to have been slow to avail himself of it. A visit to a picture gallery or an examination of the many illustrated catalogues of picture exhibitions does not reveal that amount of improvement in the art of to-day with regard to the representation of movement that one might have been led to expect. That artists, many of them—and largely—employ the aid of photography, it were vain to deny; but they seem disposed to keep in the old rut as regards subject, and utilise photography in that guise where its utility is least certain, namely, in figures and scenes, which, as far as goes the possibility of finding them quiescent or constant in effect, might have been painted from Nature. Nevertheless, if the artist does not choose to go forward in the photographic vehicle, I exhort the drivers of it to push on without him, and perhaps he will wake up to the advisability of asking for a 'lift' in it.

The rapidity with which exposures can now be made should encourage devotees of the Kodak to do their utmost to contribute to our studies of active life, for no quality of life is so universally interesting to all, from the child upwards, as movement; and no beauty of colour or form is so alluring as the beauty of motion; but, in this matter as in all art affairs, I strongly deprecate that most inartistic and mischievous tendency of the time towards 'record breaking;' how much better it would be if people would quietly go on making their own records, however humble, instead of trying to break other people's. Therefore, the way to serve art is not to snap at a flash of lightning, because some one else has potted a railway locomotive 'side on;' in fact, single pictures of *rapid* movements seldom convey a true impression, but there are thousands of delighful effects of short duration which the eye of the artist sees every day, and his soul bitterly regrets he is unable to catch and fix upon canvas. It would appear unnecessary to give instances, yet I may indicate one or two cases, such as the momentary grouping and posing of animals, the gentle bending of a tree as it leans to catch a zephyr's whisper, the transient expression on the human faces of the subtler shades of feeling and thought, such bodily attitudes as belong to actions, though not necessarily very rapid or energetic, and also poses that are stationary, but would be too irksome for a model to keep long enough for them to be sketched. Then, accompanying human movements, there is the most beautiful counterpoint of the drapery. Who that has studied the splendid attempts of the greatest painters of the past to realise the fluttering and undulation of folds of drapery as they are made and unmade by the action of the limbs beneath them, or are tossed and convoluted by the playing of the winds, but must have felt how thankful even such artists would have been for the aid of such memoranda of similar charming but fleeting phenomena as photography could have supplied had it then existed?

NOTE ON PHOTOGRAPHING 'DOUBLES.'

By H. Hands.

In various books directions are given how to obtain 'binary' photographs by inserting in the lens' hood a disc of cardboard, cut so as to shield one-half the plate, the hood then being turned a half revolution after capping lens, and a second exposure being made when the sitter is in position. The object of this note is to point out that with different-sized stops different discs will be required. That is, working with *f*-8 the disc will require considerably *less* cut away than one for use with *f*-16, and so on. Of course you would find out this for yourself, did you attempt to use different stops with the one disc, but it is as well to save a plate. This isn't of much consequence, true, but the time spent in arranging your sitter, and in developing your plate, is a consideration, to say nothing of the trouble to the sitter It would be disappointing to find you could not get him again, and you would feel inclined to do yourself an injury should the plate show signs that it would have been a 'gem' but for your mistake. Make discs for different stops, and mark them.

ENAMELLING PRINTS.

By John Birtles.

Every one who has been accustomed to enamel his prints to obtain a highly glazed surface which is so much in vogue, has been frequently annoyed by the adhesion of the print to the glass, and it generally happens that the refractory print is either one of the best in the batch, or perhaps the only one, and one which cannot be replaced. The following simple hints will be useful to such, both in avoiding the adhesion, and in emergency, saving a valuable print that would otherwise be lost. My advice is to give up using French chalk, wax solution, or whatever you have been in the habit of employing and try ordinary paraffin oil such as is to be found in every household. Clean the glass thoroughly, dry and polish, then with a bit of rag rub the surface well with a few drops of the oil and wipe off with a clean cloth.

Sufficient of the less volatile constituents of the paraffin will remain to prevent adhesion of the print, and no trouble will be experienced when the print is dry, and in most cases the print will come off without touching it at all.

Another excellent method is to get a few pieces of tin cut to the size required. Rub this, with a solution of bichloride of mercury, or, better still, nitrate of mercury, which will produce an amalgam with the tin and by rubbing take a high polish. Squeegee the print on to this, and they will jump off when dry, and the tin only requires a slight rub to be ready for use again. This never fails.

If you have a print down upon glass which refuses to strip except in small pieces and you are anxious to save it, proceed as follows. Sponge the back of the print wlth a five or ten grain to the ounce solution of either potassium or sodium fluoride, made acid with acetic acid, about half a drachm to the ounce, added just before use. In a few minutes the print will lift off with ease, and without any damage, and after a short washing may be either dried or squeegeed down on another glass or tin for enamelling.

By keeping the sodium fluoride ready dissolved for any such emergency many valuable prints may be saved from destruction, and much anxiety of mind avoided by the enameller.

AH!

By Rev. J. Carter Browne, D.D.

These two initials represent two subjects which must form my short contribution to the Almanac of this year.

A. for actinograph, or any other apparatus for determining exposure. All are agreed that, even when one's picture is taken, much depends upon the brain sauce used with the developer; but, from some considerable experience, I have found that nearly all the beauty of the resulting *cliché* depends upon the exposure. I have used an actinograph for several years, and never found it to fail me, given that the personal equation in regard to the light has been correct. I have written to several firms urging them to give the speed by Warnerké, Hurter & Driffield, and others, but have met with refusal from most of them. At least, it would not be difficult to give a comparative statement on each box of plates without in any way compromising themselves. The plate of my favourite make I was compelled to abandon, owing to their refusal to give even an approximate number for the H. & D. actinograph.

H. for halation. Some plates have been for some time on the market which, to a great extent, do away with halation; but, being about the only ones which profess to accomplish the cure, throws one into the hands of that firm alone, when one has been using and learning all about another make of plate for years. I welcome a pad which is now in the market, which serves for any plate, and which, up to the present, has never given a trace of that *bête noir* to the devotee of interiors. It is perfectly clean and easy to work, and has an ameliorating effect on exteriors as well as interiors. Using, as I always do, a changing box, I cut the pads to an eighth of an inch smaller than the plates, and have no difficulty whatever in sliding them into the dark slide and back again. They require even less care in fixing than the manufacturers suggest,

ANOTHER OXYGEN PROCESS.

By S. Dicker.

As this Almanac will be read considerably during the winter months, when the lantern is more in evidence than the camera, perhaps a note on a new oxygen-producing process may be acceptable. It is the outcome of the inventive genius of Dr Linde, the well-known German experimentalist, and differs from the chemical processes of extracting oxygen gas from air in that it is a mechanical operation, the oxygen and nitrogen being separated by reducing air to the liquid state, when, on allowing the liquid air to evaporate, the nitrogen is given off in the form of gas before the oxygen, in fact the separation is effected by taking advantage of the different boiling points at which nitrogen and oxygen are given off from liquid air. Great difficulty has heretofore been experienced in liquifying air owing to the low temperature necessary, but Dr. Linde has devised a system of compressor, coolers and throttle valve whereby the liquification of common air has been greatly facilitated. Now, as regards the purity of the oxygen gas so obtained, and its adaptability to the use of the optical lantern, it is somewhat early at the present moment to hazard an opinion, since very little is yet known about the ability of thus producing the oxygen, quite, or nearly, free from nitrogen. In the trials made some little time ago a gas containing 70 per cent. of oxygen was produced at a cost of something like 1*s*. 2*d*. per 1000 feet. Of course, 70 per cent. purity is not good enough for lantern work, and it remains to be seen whether a purer gas of 90 to 95 per cent. oxygen cannot be obtained, by allowing more nitrogen to ‘boil off’ even if some oxygen is lost at the same time. If this is so, it would seem that the necessary plant would be less expensive than the elaborate apparatus now employed in the commercial production of oxygen gas.

PHOTOGRAPHING ICE CRYSTAL FORMS BINOCULARLY.

By J. F. Hammond.

To obtain the crystal forms take a fairly good-sized porcelain dish, and fill same with clean water, leaving in the bottom of the dish a waste negative, and put the dish with negative into a shaded corner out of doors on a frosty night, and leave until morning, when a variety of crystal forms may be seen. The shapes of these may be various, such as those of leaves, butterflies' wings, &c. The dish of ice forms, as it is unsuitable to photograph, owing to there being no contrast between the whiteness of the crystals and dish, can be rendered so by chipping a small hole in one corner of the ice and pouring in through the hole made sufficient quantity of black ink, or some non-actinic-coloured liquid, sufficient to cover the bottom of the dish and negative. The whole is now ready to be photographed, singly, or binocularly, in part, or whole, the camera being in a downward position.

It is supposed that the presence of the negative in the water is the means of causing a greater variety in the ice forms, and it is thus obvious that any object could be placed in the water so long as it didn't appear above the ink, and so on the photographic image.

HAND CAMERA OR TRIPOD CAMERA?

By W. K. Burton (Imperial University, Tokyo, Japan).

Of the many questions asked me by photographers or would-be photographers, there is perhaps none more common than that which is formulated somewhat as follows: 'I am thinking of taking up photography, and would like to know whether you would advise me to get a hand camera' (it is very commonly called a 'detective' or a 'Kodak'), 'or one on legs.'

To Dives the answer is simple enough, 'Get both a hand camera for quarter-plate or 5 × 4, a tripod camera for a size as much larger than 5 × 4 as you like.'

The hand camera is an instrument of the greatest possible use. It is difficult to say too much in its favour, but still—spite of Mr. Walter D. Welford—I have not lost faith in the tripod camera. By the way, Mr. Welford, for whom I entertain feelings of the highest respect, sometimes amuses me. Every now and then he lashes himself into a fury, and issues forth to slay the opponents of the hand camera. But where are these opponents? In Mr. Welford's own mind *only*, so far as I can make out. Most real photographers have a contempt for 'press-the-buttonists,' and have no great respect for the 'snap-shottist' who blazes away at all and sundry objects, never dreaming that to use a hand camera *in the hand* needs all the skill that is wanted to use a tripod camera, and a good deal more in addition, but I know of no one whose opinion is worthy of consideration who is opposed to the legitimate use of the hand camera by those who have the necessary skill to use it.

As I fully appreciate the advantages of the hand camera, and have not yet lost faith in the tripod, my advice to those who can invest in one camera only commonly is to purchase one that can be used either in the hand or on a camera stand. Most cameras sold as 'hand cameras' have an attachment for the tripod, but, to make a camera thoroughly suited to tripod work, there should be more than this. It should be possible to use a focussing screen, and the adjustments should be such that a long-focus lens can be used if it appears desirable to do so. Wide-angle work can seldom be done with a hand camera, and this style of work is so seldom other than objectionable that it may well be neglected altogether. The matters of focussing screen and long focus become of more importance the larger the size that is to be worked.

The limits of size of a camera that can be used with any comfort in the hand and will produce results of any practical use may be said to lie between 3¼ × 3¼ inches and 6½ × 4¾. The considerations that should determine the size are as to whether the primary use of the instrument is to be that of a hand camera, the secondary that of a tripod camera, or whether the primary use is to be that of a tripod camera, the secondary that of a hand camera.

Thus, taking the two extremes, the 3¼ × 3¼ camera is, of course, of a very convenient size to use in the hand, but beyond this the 'depth' of the short-focus lens with so small a plate permits the use of large apertures, so that instantaneous exposures can generally be given, whilst this same 'depth' makes the use of a focussing screen almost unnecessary, even when taking head-and-shoulder portraits.

With the half-plate (6½ × 4¾) camera, the conditions are quite different.

The size is such that the camera can be used in the hand, but certainly barely with convenience. The lens must be of fairly long focus, and the 'depth' is so small that stopping down is frequently necessary, exposures are lengthened, and the tripod becomes more frequently necessary. This same want of 'depth' renders it practically quite necessary to use the focussing screen when photographing heads, or, in fact, in photographing any near object, when it is desirable to use a large aperture.

The smaller camera might be described as a 'hand camera that can be used on a stand;' the larger as 'a tripod camera that can be used in the hand.'

Between the two extremes mentioned there lie various sizes, the most popular of which are $4\frac{1}{4} \times 3\frac{1}{4}$ and 5×4. These are about equally well fitted for hand and tripod work, and the advice I generally give when the question is put as given at the beginning of this communication, without further details, is somewhat to the following effect: 'Get a hand camera for $4\frac{1}{4} \times 3\frac{1}{4}$, or for 5×4, that can be used on a tripod, that permits of focussing by a screen, and that will open so far that a lens of at least $8\frac{1}{2}$ inches for quarter-plate, 10 inches for half-plate, can be used.' Further advice as to the relative advantages of dark slides, changing boxes, and magazines might be given, but that I have myself no decided views on the subject.

A DARK-ROOM DISCOMFITURE AND ITS REMEDY.

By R. L. Maddox, M.D., Hon. Fell. R.M.S. &c.

In 1859, when there were no Kodaks, Kodets and films to facilitate photographic pursuits, I made very many experiments on paper prepared with Japan vegetable wax, turpentine, paraffin, benzole, belmontine, and duly sensitised them to try and procure a paper substitute for collodion on glass, and as a departure from the ordinary iodised paper. That the plan gave some measure of success the accompanying will show, as I was able to take portraits in the open with a Voigtlander combination.

Upon the Editor's call this year for a short article for the Almanac, I thought I would try and modify the process, so as to come nearer the requirements of the present day. Accordingly some papers were prepared with paraffin (crystal oil), benzoline, and solid paraffin bromising them with an albumen solution, and then sensitising and washing them.

The first part of the process was conducted in ordinary daylight on some of Causon's *old* thin letter paper. For several months I had not used the dark room for any photographic purpose, but now, on making the attempt to sensitise the papers in the dark room, illuminated as usual with lamp and *clear* red glass, I had not been in the room for more than ten minutes before I was seized, without any warning, with a copious burst of perspiration, with extreme faintness and sickness. All attempts to overcome this unpleasant condition failed, and I was obliged to withdraw, having some difficulty to find the handle of the door. Once outside, this treacherous feeling speedily passed away.

The next day another attempt was made, but in about fifteen minutes the same symptoms returned, and I had to hasten from the room. This was the fourth time I had suffered a similar attack, which I concluded might be due to using a *clear* red illumination. On thinking the matter over, and knowing that I am able to produce at will under very delicate muscular pressure of the closed eyelids, with the back turned towards the light, all the colours of the spectrum as subjective phenomena, the colours passing as fleeting irregular discs of different expansion, yellow being the most difficult to induce, it struck me that the retina, and through it the colour perception in the brain, might be in a condition of super-sensitiveness to red light; hence I resolved to try and lessen it, which I did after the following plan. I had previously made a very fair imitation matt ground glass by the use of the dry resinous extract of tolu and shellac dissolved in wood naphtha, so sufficient was at once made—in the proportion of ten grains of the finely powdered extract, to five grains of finely crushed orange shellac to one ounce of the solvent (possibly alcohol might answer as well). When dissolved, this was strained and poured over one surface of the sheet of red glass, drained off, allowed to dry, and then placed in front of the lamp. As both these bodies are more or less of an orange tint, it struck me they might slightly add to the protective power, even in a thin layer. The papers that had been so hurriedly sensitised were tried under these altered conditions of the coloured glass, and without any discomfort I found I could continue work in the dark room. The papers proved to be sadly mottled, so I turned to some prepared bromide printing paper, and, happening to have some of Eastman's 'B smooth' at hand, this was exposed and developed. Some thin bromide paper, 'A smooth' was procured, and from my workroom window several pieces were exposed on the view, the successive exposures varying from thirty seconds to five seconds, less time was not tried. These were developed with various strengths of oxalate developer, and fixed after usual treatment with hypo solution. When washed and dried, these negatives were placed for twenty-four hours or more in a mixture of ten grains of solid paraffin dissolved in two ounces each of crystal oil and benzoline. They were afterwards removed to a fresh and stronger solution containing one drachm each of solid paraffin and white wax, with two drachms of castor oil in two ounces each of benzoline and crystal oil, the solution being effected by a warm-water bath. The negatives were plunged into this as taken, with slight draining, from the weak solution, and left soaking for about eight hours, the warmth being kept up. The object was to displace the lighter by the denser fluid, so as to well charge the paper before finally waxing with the aid of a hot iron, as in the old method. Some of the results are forwarded for the Editor's inspection.

It may be asked well, What of all this? No doubt it can be guessed as a suggestion, that a fine-textured, thin, hard paper spread with the usual rapid film bromide emulsion might be advantageously placed on the market, not to supplant films, but as a fairly cheap substitute when these are not at hand, and where the greatest delicacy of delineation is not demanded. Such papers could be used from the roll-holder, as well as when cut into sizes, and exposed pressed against a thin white glass, as in the present case, by a stiff sheet of dark cardboard, or, better still, of thin sheet ebonite. Facility of carriage, ease of manipulation, though accompanied by a trifling trouble to finish the negatives by waxing, may induce some in want of such a method to give it a trial. Other methods of development might furnish better results. Such negatives when dried on waxed glass, as in one example sent, may give finer printing definition.

Could not a very thin paper be rolled with pressure on to the surface of a thicker one as a support, and simply made adherent by such pressure, then the thin paper covered by the emulsion to be after development separated from its support and finally waxed? Possibly, for sufficient adherence, the thick paper support might need to be surface-covered with a weak mucilaginous substance, as filtered rice water, with a little glycerine to facilitate separation when wet.

DEVELOPING EXPERIENCES AND OTHER MATTERS.

By W. Bishop.

'Some subject of general interest.' I think that for the sake of a good many readers of the Almanac I can hardly do better than narrate an experience of developing which has come to me this summer season. Returning from holiday haunts with a considerable number of exposed plates needing development, I found very soon that, from one cause and another, I had been guilty of very serious over-exposure, and, working with metol and hydroquinone, plate after plate was spoiled. Although I have used these developers as long as they have been in the market, I had to confess myself fairly beaten. Between the over-exposure referred to and the hot weather at time of development, I could not get control by any combination of developer and restrainer, and some of the plates I most wanted were hopelessly lost in fog. What best to do under the circumstances was the point to be considered, and I decided to go back to first principles and try the effect of pyro and soda (or soda and potash) applied with care. The result was thoroughly satisfactory, the rest of the plates being saved and turning out good, clean-printing negatives. I tell the story here as a reminder to others that, however valuable the newer developers may be, the older—shall I say the oldest?—developer is as good as ever, and, under normal conditions, cannot be beaten for results, while in many cases the control which it gives over errors in exposure renders it of special value. With regard to keeping powers, the pyro solution which I used had been made for more than two years.

Now, with the permission of the Editor, I want to say a few words more on another subject which I have before now been somewhat persistent about, and that is the combined toning and fixing bath for gelatino-chloride paper. During the past year a good deal has been written on the subject, and the chemists have had the matter nearly all their own way. The theory that a combined bath contains all imaginable elements of danger, and none of the conditions of permanency, has been so wonderfully and completely set up that everybody ought to be afraid to use anything for these papers but the separate (sulphocyanide) baths. The latest contribution is Mr. Bothamley's series of experiments, from which he argues that, as the toning can be done without either lead or gold, or with lead and without gold, there is nothing to show that the gold has anything to do with it, and that (logically, therefore) there is a very great risk that the toning, when done with the combined bath, will be sulphur toning, and therefore fugitive.

But, as Galileo said, the world 'still moves,' and I do not think that many who have deliberately adopted the combined bath in the past, and who know for themselves how it works in practice, will be inclined to give it up, however perfect the theory against it may be.

I have carefully gone over Mr. Bothamley's experiments, and readily admit that tones more or less resembling those usually obtained can be arrived at, first—without either lead or gold, and, second—with lead and without gold; but, when compared side by side with the tones obtained by the complete bath, they leave much to be desired, and show that there is a richness and quality in the fully toned prints that must be due to the gold, and that alone. On the question of permanency, my own experience agrees with that of many others; we have used the combined bath from the first appearance of the gelatino-chloride papers, and up to the present time no signs of fading have appeared.

No one can doubt that with the separate baths most perfect results can be obtained; but I do claim, and so do others with me, that with the combined bath, properly and *liberally* used, equally good results can be produced, with less labour and with no risk of double toning, while the surface of the prints, even in hot weather, is rendered so tough as to allow of handling without fear of damage.

I may just note, heretic that I am, that, although it is, of course, proper form to decry sulphur toning as fugitive, there are to be found many prints of the old days which were avowedly sulphur toned, and are still as good as ever.

WHAT IS NEEDED TO SECURE GOOD PHOTOGRAPHS?

By Rev. B. Holland.

The question, no doubt, can be answered in various ways, and perhaps no two workers would give the same reply. All, of course, will agree that a good plate is necessary, and, as there are so many in the market, the choice is extensive; but why do not more men make their own? If proper care is used, it is not difficult, and there is the satisfaction of knowing that, by careful manipulation, you can secure just what is best suited to your requirements.

Given the plate, a suitable camera follows. Just now the most popular form seems to be one which can be held in the hand without a tripod. The writer's idea is that it should be as simple as possible, and that a home-made one is quite as effective as the more expensive so largely advertised. Complicated movements in it are likely to be troublesome and confusing, and professedly wonder-working lenses somewhat deceptive. The one I use is a small rectangular box with both lens and focus fixed. The lens is a little meniscus of cheap make, which has been adopted after many trials of other forms, and, when I say work has been turned out with it equal, if not superior, to much done by rectilinears and others, few need fear to employ it, even for competitive pictures.

As an aid towards securing a real picture, a properly made finder cannot be beaten—not a tiny thing, which can only be used with much straining of the eye, but one which will permit of the view being accurately composed, and show it luminous enough to obviate mistakes. Such a one can be had—if not by buying, by making—and it will prove a true friend.

That a certain amount of artistic skill is also necessary all, doubtless, will admit, and a study of the best productions in exhibitions and elsewhere will greatly help its attainment. The eye needs to be trained to see a picture at a glance; some can train it quickly, others only after long perseverance and many failures, but patience here will accomplish much, and eventually be well rewarded.

If, after years of practice in these directions, my advice is worth anything, it is something like this: Let the young photographer especially do everything with a definite aim in view; not burden himself with a multitude of knick-knacks made as much to sell as to use; never allow a defect to pass without seeking to discover its cause; work with unceasing care and patience, and let simplicity in all things be the rule. Simple apparatus and simple 'bits' will bring more satisfaction, and possibly more renown, than foolish pretentiousness or crude ambition.

UNCOATED *VERSUS* COATED PAPER FOR POSITIVES.

By Thomas Earp.

I have latterly been led to compare the relative merits of silver prints on uncoated, and on gelatine, or albumen-coated sensitised papers, and find that, for any but what may be termed miniature work, given a fair negative, the former is very much preferable to the latter. This opinion has been endorsed by others when prints from the same negative have been the subject of observation, the uncoated paper giving much more brilliant and generally satisfactory results. I have noticed, as the outcome of many years of experience and experiment, that gelatine is not by any means desirable as an ingredient in a salting bath for paper, and that its use is perfectly unnecessary for the purpose of keeping the image on the surface as has been supposed, this result being better attained by *soaking* the paper in a salting bath, and sensitising by *floating* on the silver solution. Gelatine is apt to render toning more difficult and costly in expenditure of gold, and this is another disadvantage in addition to that of employing an animal substance liable to decomposition in the preparation of the paper.

A good paper with which the printed image is, as it were, incorporated is more likely to furnish stable prints than one in which the image merely exists in a film of gelatine or the like on its surface.

I have latterly employed a weak solution of bichromate for the purpose of eliminating the last traces of hyposulphite from the fixed prints, or rather of converting it into sulphate and thus rendering it innocuous.

The bichromate has another use in obtaining prints of a rosy tone, something similar to that of drawings in red chalk so much admired by some, and, for the benefit of those who may feel inclined to try the process, I subjoin my method of proceeding.

1. The paper is salted by immersion for about three minutes in the following bath:—

Chloride of ammonium	100 grains.
Bromide ,,	10 ,,
Water	20 ounces.

Bichromate solution to tint the above to a lemon yellow.

2. The sensitising bath may be—

A.

Nitrate of silver	1 ounce.
Distilled (or rain) water	10 ounces.

Liquor ammoniæ till precipitate first formed is just redissolved.

or—

B.

Nitrate of silver	1 ounce.
Water (rain or distilled)	10 ounces.
Nitric acid	10 minims.

Paper sensitised in bath A does not keep so well as that prepared in bath B, but tones more readily, and is such as I have generally used as most amenable to subsequent treatment. It is best to keep the sensitised paper or untoned prints in a calcium tube, which may be cheaply improvised from one of the self-closing tins in which golden syrup and other things are sold, placing in it a small earthen jar containing some calcium chloride covered with a plug of cotton-wool.

Toning, with this paper, is a matter of taste. If the print be placed directly into the fixing bath of hypo and, when the free silver is removed, at once washed and dried, good brown tones are obtained. For red tones, the fixed, unwashed prints are flooded with a weak solution of bichromate, which reduces them slightly while changing the colour. (Whatman's water-colour paper gives the best red prints, a little warm water aiding the change.) For engraving-black prints, a preliminary washing is followed, when sensitiser B is used, by treatment with a weak solution of washing soda to remove any free acid, this latter being unnecessary when bath A is employed. For brown and black tones Rives' paper is best. Immersion in an ordinary acetate of soda gold toning bath, but one of only half the strength of that usually recommended, tones completely in two or three minutes.

Fixing in hypo (three ounces to pint) and the usual washing completes the process.

Thick rough paper requires longer immersion in the salting bath, and, in fact, takes longer to sensitise, tone, fix, and wash than the thin Rives' or other paper, but yields results more desirable for large, bold work than can be obtained on the thin, smooth papers.

THE EQUIVALENT FOCUS.

By R. H. Bow, C. E., F.R.S.E.

The equivalent focus of a combination of lenses is measured by the focal length of a single lens capable, when substituted for it, of giving exactly the same size of image, the distance between the object and focussing screen remaining the same.

Taking the case of a doublet. Let it consist of lenses having the focal lengths equal to K and L and placed a distance apart equal to c. Then the formula given for the equivalent (solar) focus is—

$$F=\frac{KL}{K+L-c}, \text{ if both lenses be convex.}$$

If one of the lenses, say, L, be concave, we make each L in the formula negative, and it does not matter which way the doublet is turned.

As an example, we may take an opera glass. Let K, the object-glass, have the focus $=6$; and L, the concave eyeglass, have the focus $=1\cdot5$; then, in order to get an image, $L+c$ must exceed K. The following table shows the value of F given by different values of c:—

When $c=5$ $F=18$
,, $c=4\cdot8$ $F=30$
,, $c=4\cdot7$ $F=45$
,, $c=4\cdot6$ $F=90$
,, $c=4\cdot5$ the emitted rays are parallel.

The above formula gives sufficiently accurate results when M, the magnitude of the image compared with the object, is very small or very large; but when the image is of the same size as the object—that is, when $M=1$—the error becomes a maximum, and, if c be relatively large, it may be very considerable.

I may here give the correct formulæ for the equivalent focus when $M=1$:—

$$F=\frac{KL-\frac{1}{4}c^2}{K+L-c}, \text{ when both lenses are convex.}$$

$$F=\frac{KL+\frac{1}{4}c^2}{L+c-K}, \text{ when lens L is concave.}$$

It would be out of place to enter into the calculation of F for other values of M; but, as perhaps possessing some interest, I give results for two examples in the following table. In the first example we have two convex lenses, of foci $=8$ and 6, and at a distance $c=2$ apart. In the second example there is a convex lens, K, of focus $=3$, and a concave, L, of four inches, the interval, c, being here also $=2$:—

VALUES OF EQUIVALENT FOCI.

	Example 1.	Example 2.
M= 1	3·917	4·333
M= 2 or 0·5	3·926	4·296
M= 10 or 0·1	3·972	4·110
M= 100 or 0·01	3·997	4·013
M=1000 or 0·001	4·000	4·000

It is not strictly correct, therefore, to speak of the equivalent focus of a doublet as though it were of a constant value; the value varies somewhat with the relative size of the image, decreasing in the first example and increasing in the second as M approaches unity.

The term 'equivalent solar focus' is unobjectionable.

PHOTOGRAPHY AND THE CYCLE.

By J. Pike.

For some years I have been a wheelman, but it is only recently that photography has played any active part in the weekly (and oftener, if possible) jaunts, for which I must confess to great partiality.

The fact is, *ordinary* outfits and glass plates are too heavy; the usual paraphernalia, with tripod, &c., are often nothing but a nuisance, and one very quickly comes to the conclusion that it is a delusion and a snare, that you cannot do two things at once. Is it to be a cycle run or a photographic trip? and between the two questions the camera generally comes to grief.

The greatest enjoyment comes when the camera is carried merely as an accessory and part of the machine, not so heavy as to be a *load* in the event of dull weather, but always ready for use if the climatic conditions are favourable, and one feels disposed to photograph, and if subjects are met with which one feels wishful to secure mementoes of.

A hand camera, of course, is chosen, though a tripod may at times be useful. The latter will be wanted about once in a hundred times, and then you very heartily wish you had one.

Not to mention any names, for I hold no brief for any manufacturers, a camera which carries rollable films, or films which can be changed in a moment by an automatic device, is a *sine-quâ-non.*

I have no prejudice against dark slides, very much to the contrary, and rollable films have not, in my experience, always been as satisfactory as could be wished, the whole apparatus has more than once proved defective and disappointing; but, on the whole, I am convinced there is nothing better yet on the market *for the wheelman.*

The first idea, in my mind, is '*the ride.*' Secondly, if the weather is favourable, I photograph anything I meet with which takes my fancy. Start away in this mood, and a very large amount of pleasure may be anticipated.

My rollable film camera is enclosed in a leather case, which I have fitted with straps in order to securely fasten it to the handle bar of the machine (a pneumatic, of course). The weight does not reach four pounds, therefore is not felt, and, in some cases, actually proves a blessing, as it somewhat steadies the machine.

There is a very efficient 'catch,' which is released in a moment; the camera can be "whisked out" practically in two seconds, and a picture secured if need be in less than a minute, and the camera replaced.

I have seen a complaint recently that 'club' cycling runs are being spoiled *as* club events by so many of the members carrying cameras; such members, finding by experience the association of a crowd of other fellows to interfere too much with their photographic work, gradually drop out of the runs, and run out on their own account. This may be so in some places, but I don't think it can be the case in Leicestershire, for I have, I think, *scoured* the country, and met *very few* cycling photographers indeed. This is, I think, a great pity, but one cannot be much surprised at it. It has taken years to bring me to my present opinion, and I am sure my idea is the correct one. The *ride* must be the primary object, then a light and portable and ever-ready camera, packed as much a part of the bicycle as a tool bag, helps to fill up any blank spaces in one's programme.

Finally, the results need not be all hap-hazard, ill-considered, and badly selected. No harm is done if a failure occurs, and now and then, very often in fact, one meets with very gratifying successes. To any hesitating cyclist I say, Try a rollable film camera.

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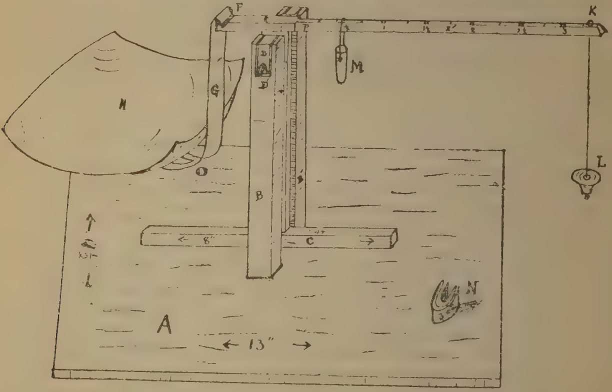
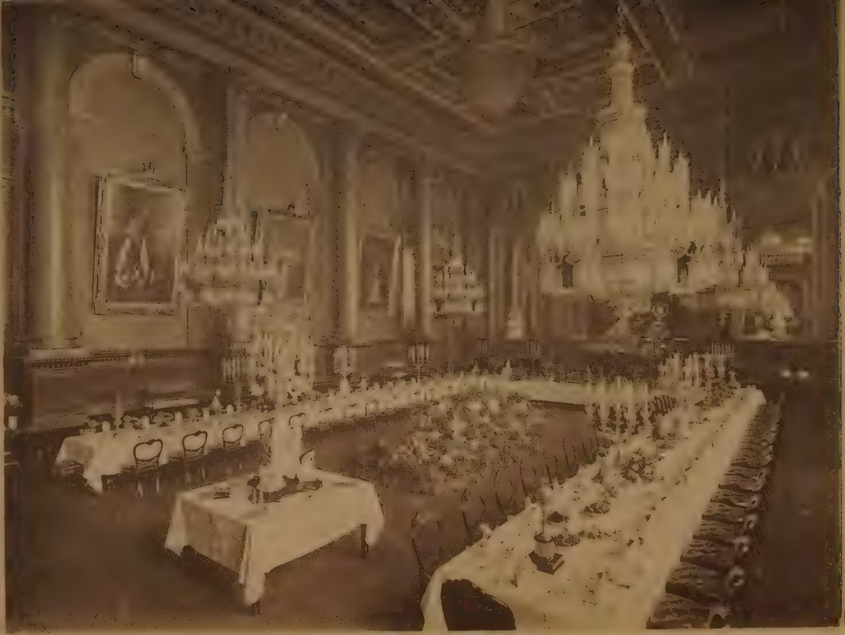
AN IMPROVED WEIGHING APPARATUS.

By H. Hands.

Following up the plan I proposed in the last issue of the Almanac, now intend to describe a very useful piece of apparatus I constructed, while out in 'camp,' from an old kerosine oil case, a piece of hoop iron and a bit of tin. This was, strange as it may read, a scale for the *accurate* weighing of chemicals from a quarter of an ounce upwards. It may sound ridiculous to talk of 'accuracy' in connexion with such a rough piece of mechanism, but try it; work carefully, and you will find it perfectly true. Moreover, it will save your pocket to the tune of many shillings—the cost of a weighing machine to do the same work. Then, again, you may be quite unable to procure the commercial article, owing to your location in some barbarous wild. I say I used the two ends of an oil case; you may use any wood that may be handy. Adapt my description of the method to anything you can get. I refer to the accompanying diagram as I proceed. The measurements refer to my own machine. The reader can make his as much larger as he wishes, increasing the parts in proportion. A is the base. It is one end of an oil case 13″ × 9½″. In the centre of this mortice the two uprights, B B′, or screw them on from the under side of the baseboard, with a space of one inch between them. B B′ are 9″ × 1″ × ¾″. At D pieces are cut out to the





THE PYX DINNER.

GOLDSMITH'S HALL, LONDON, 1895.

Photo. by J. T. Sandell, Managing Director of the Sandell Works Co., Limited,
On a "Sandell" double plate, Ross W.A. 9in. lens.

PRINTED BY THE RICHMOND COLLOTYPE PRINTING CO., LIMITED, TWICKENHAM.

depth of an inch, and at D′, at the bottom of the slot, are put bits of glass for the pivots to work upon. The little blocks, D, that we have cut out, are then hollowed as shown, to allow the pivots to work freely, and when the machine is complete, and the arm of the balance, E E′, in place, the blocks, D, are slipped in from where we cut them out. The arm, E E′, is twelve inches long by half inch square, and at $1\frac{1}{2}''$ from the end F is joined on a piece of wood $5'' \times 1'' \times \frac{1}{2}''$, and then at the bottom of this join the piece, C, which is $8'' \times 1'' \times \frac{3}{4}''$. This oscillates between B B′ by means of the pivot, which is an iron nail filed to V shape, then carefully put through the piece of wood between B B′ at about 1″ from the top, E. The wedge end of the V-shaped pivot rests on the little glass plates at D′. At the end, F, of the arm, E E′, is sawn a slot, into this slot is hooked G, a piece of iron hooping bent over as shown. This piece of hooping is 10″ long, and at O 5″ from the end. I hammered it with the thin nose of the hammer till it split and spread apart as is seen in diagram, then bent it to a curve to carry the pan, H. This pan is a 5″ square piece of kerosine oil tin, hammered to saucer shape on a piece of wood. M is a Martini rifle bullet bore, and a wire loop put through it, which loop passes over the bar, E E′. At the end of the bar, E E′, at K, is bored a hole, and through this hole is passed a thin wire 5″ long, then the end twisted to keep it suspended. L is half a common cotton spool (or reel) hanging at the end of the wire, in order to carry the weights, N. The latter are made of bent hoop iron, and slip on to the reel, L.

Having made the machine, we must proceed to adjust it. Hook on the fork, G; place the pan, H, in position; hang the bullet, M, at zero, *i.e.* at P, first cutting a fine slot on the bar to fix the zero point; fix the spool, L, in its place, and then see that the upright piece between B B′ is not touching the latter. Now see which side has the most 'pudding,' and take it away. In other words, if the pan side is heaviest, proceed to cut away the pan at the edges till the scale balances correctly, this being so when the edges of the centre bar between B′ B hang perfectly flush with the edges of B B′. Snipping the pan will answer if only a slight adjustment be required. If there is much difference, it must be adjusted by cutting off a *little* at a time from the end of the arm, E E′, at F or K, as the case may be. Slight difference can be compensated at the end K by paring away the spool, L. A difference is also made by bending the iron that supports the pan at the point G, either way, *i.e.* towards or away from the uprights, B B′. We have now to graduate the arm E E′. Every photographer has a small balance for weighing chemicals in grains, with weights of two drachms, &c. All right; get some fine, clean sand; carefully weigh out two drachms and put it in the centre of the pan. Move the weight, M, along the arm till it exactly balances the pans; add another two drachms, and move the weight to balance it, and so on to the end of the arm, carefully marking each time the exact spot where rests the wire loop of weight. Now we want the extra weights, N. Get some hoop iron and bend it as shown, and, having left the sand in the pan and moved the weight, M, to zero at P, cut or break the iron till on placing it on the spool L it exactly balances the pan. This piece of bent iron then represents the weight of the sand in the pan, and should be marked accordingly. You can make as many of these as you wish, the limit being, of course, the amount of stuff the pan will carry, and the arm, E E′, support without bending. This machine, if carefully adjusted as directed, will enable you to measure exactly to half a drachm. The bearings of the pivot must be sharp, and the parts work without friction. It can always be adjusted; can be packed in your bag, as it is easily taken apart and set up; you can make several for a mere song, or you can have different pans for hypo, alum, &c. The diagram is not to scale, but drawn from my own as it stands before me; still, no one should have the slightest difficulty in making one like it, while the material for it will be found in any place.

SLIDES *V.* CHANGING BOXES.

By F. H. Burton.

While the various makes of changing boxes—good, bad, and indifferent—may answer fairly well in small sizes—say, up to half-plate—there is no doubt at all they are a dismal failure for whole-plate work and upwards.

For a couple of years I have struggled with a whole-plate changing box of the best make obtainable, and have come to the conclusion that it is a very neat piece of mechanism, but of very little use to the serious worker. I prefer to work whole-plate on tour. Thanks to aluminium, camera, lens, and stand can be procured which can be carried by any able-bodied man; but the films are the difficulty, and in this connexion I fearlessly state there is not a whole-plate changing box on the market that is worth having as a gift; apart from the jamming and other peculiarities to which these appliances are specially liable, the whole principle is utterly wrong. No camera fit for a tourist will carry a whole-plate changing box loaded with twelve or twenty-four films in sheaths of any kind—the weight is too great for a delicately constructed camera, and the strain upon it, as well as upon the temper of the unfortunate worker, can only be appreciated by those who have tried it. I am aware there are other forms of changing boxes, where the films are passed into a single slide in the open, and this is the better plan; but such forms are too complicated, and the roll-holder is objectionable, on the ground of bulk and weight, to say nothing about the pleasures of developing rollable film. No, what is really wanted is an improved film slide—lighter and thinner than any now on the market. What is the need for the regulation quarter-inch register? Why cannot our cameras and slides be made with one-eighth of an inch register? Surely plates of metal one-sixteenth thick would secure firm contact as well as wood one-eighth thick, and, so far as I know, this would solve the whole problem, and we might have double film slides of serviceable quality, with draw-out shutters of flexible material, not exceeding half an inch in width.

Nothing will ever compete with the double slide for large sizes. What we want is a perfect form of it. Will some enterprising manufacturer make a note of it?

AN AID TO MEMORY.

By Rev. F. C. Lambert, M.A.

What is more annoying than to find, when you are miles away from home and on photographic pleasure bent, that you have forgotten some important part of your apparatus—the lens, cap, or stops, the triangle or screw, note-book or colour screen? How simple and easy it is to be wise after the mishap has taught one experience!

Will any reader be wise enough to profit by another's sorrowful experience *before* the mishap comes home? I almost doubt it; yet I put the chance before him *now*, so that, when misfortune does come upon him, through that pride which goeth before a fall, I may exult and say, 'Yah, I told you so!'

My advice is this, Take a sheet of cardboard—not so small that it is likely to be mislaid, and yet not too large for any ordinary camera case, say, eight by six inches—and upon it make a complete list of all the things you are likely to want, and *before starting* see that you have them all at hand.

It will be found of great convenience and an aid to memory to arrange the items under certain convenient headings. My own plan is somewhat as follows:—

1. *Camera.*—Camera, case, spare front, sliding partitions, focussing cloth, straps.
2. *Slides.*—Slides, case.
3. *Stand.*—Legs, triangle, screw, straps, elastic bands (for umbrella, &c.).
4. *Optical.*—Each lens mentioned by maker's name, *e.g.*, Ross's RS. 12″, bag, stops and case, cap, various adapter flanges, pinhole apparatus, coloured glasses.
5. *Sundries.*—Shutter, sky shade, spirit level, focussing glass, view meter, note books addresses, guide books.
6. *Changing.*—Lamp, candles, orange paper, Turkey twill, drawing pins, dusting brush, number labels, wrapping papers, plates or films.

As a matter of fact, my own list varies slightly from this, *e.g.*, I omit 'triangle,' because my field camera has a turntable fixed to it, and it cannot very well be forgotten. Again, there are one or two other things I generally take for certain experimental purposes which need not here be mentioned. Obviously, then, each reader can easily modify the list according to his own requirements.

PHOTOGRAPHIC SLANG.

By H. P. Robinson.

There is a tendency of late among photographers, whom we would not willingly accuse of any greater crime than thoughtlessness, to speak of their art in clipped and maimed English, which has the effect of slighting and cheapening their good friend and constant companion, and of which they would not think of speaking a disparaging word if they knew it. I will mention but two of these misused words here as samples, others will occur to the reader. The one is a clipped word, 'photo,' and the other a disastrous attempt at a new one, 'photogram.'

The word 'photo' is an insidious word, that may easily creep into the language, especially in these bustling times when people persuade themselves their time is of so much importance that they have scarcely sufficient to spare for the proper pronunciation of any one word, and speak of institutions by their initials, so that those who are not intimately acquainted with the subject find it is difficult to understand what is being written or talked about.

As an example. Some time ago there was an admirable paper read at the Camera Club by a much-respected member. I was much interested in the subject, and anxious to give the paper a careful reading, but the way the author had clipped the word photograph down to 'photo' acted like an emetic, and quite spoiled my enjoyment of his paper.

The other word I have mentioned is bad enough, but not so dangerous as 'photo.' 'Photogram' may be trusted to cure itself in a year or two, and will not be a permanent blot on the language. It is not euphonious enough to live. A rose by any other name *may* smell as sweet, but I doubt it. It would be only very matter-of-fact people—the Bounderbys of this world—who would be satisfied with the perfume, and give up the poetry and sentiment connected with the queen of flowers. An analogous sentiment is attached to the word 'photograph,' the name by which we have known the products of our art from its birth. Nevertheless, I have little objection to the introduction of new words, provided they are better than those we have been using and there is honest reason for the change, but 'photogram' is a hard-sounding, commercial, kind of word, very disagreeable to the sensitive ear when compared with photograph. I have taken pains to get at the opinions of photographers, and find it is disliked by everybody I have spoken to about it, but is tolerated for other than artistic or linguistic reasons, and I confess that I have myself temporised with principle, and not been so energetic in endeavouring to suppress the word as I ought to have been. One man, indeed, that I asked cared so little for what injurious word photography was called by, that he asked, 'Will it pay? will the use of the word photogram enable me to show an old photograph and persuade the simple public that I have got something new?' I didn't know that it would, not being clever in advertising dodges, and this is not the sort of question that interests me, or the kind of man that anybody would suspect of doing good work or anything worthy of being copyrighted, or I should appeal to his pocket by telling him that, among other disadvantages of the use of the obnoxious word, he could not register a photogram. You may register a painting, drawing, or photograph;' the Copyright Act does not provide for 'photograms.' To register a 'photogram' you must drop your principles, and call it something else—to wit, a photograph.

DEVELOPMENT OF BRIEF EXPOSURES.

By W. J. Stillman.

Repeated and precise experiments on the development of exposures as short as 1-1000th of a second have satisfied me that for all the qualities desirable in a developer there is nothing quite equal to glycine, either taken alone or in combination with metol, quinol, eikonogen, or any similar agent; and, of the various combinations which are practicable, I find that of glycine as a base, and metol to the extent of ten per cent. of the glycine, to be the safest and on the whole that which will bring out what is in the negative most securely. This developer has two qualities which I have not found to be possessed in equal degree by any other, viz., that when it is of the proper strength it does not make the high lights too dense before all is got out of the shadows that is in them, and there is no tendency to fog or produce irregular markings on the negative, when it is allowed to lie without rocking. I have left a negative in the developer unmoved while I was developing, fixing, and washing two or three others, without finding any ill effect produced by it. Metol alone has several defects which make it undesirable; it develops so rapidly that it is quite impossible to control the development if there is over-exposure; if it is pushed beyond a certain limit, it will produce fog, and with minimum exposures it does not allow the lights to be carried to such a degree of density without a veiling of the shadows as is possible with glycine alone. But glycine alone is too slow for most people, and the addition of a tenth of metol accelerates the action to a reasonable rapidity. With a slight addition of quinol the printing colour is better, and the rapidity of the development about the same as with glycine pure, the printing colour being, however, arrived at at an earlier stage of the development, *i.e.*, with a given density of the image that produced by the addition of quinol gives a stronger print.

In speaking of relative rapidity I do not wish to be understood as saying that there is a difference of remarkable degree—it seems to me that, if we make a careful trial of all the usual developers under their best conditions, we should not find any one of them to abbreviate the exposure required by any other more than 5 per cent., and the difference between glycine, metol, and a mixture of glycine and eikonogen or quinol, or all these together, will be very much less than that, so that it is only when the utmost power of the developer is required that glycine shows its power. It is not stronger than pyrogallol—no agent surpasses that; and, when the extreme power of it is employed, it will find the least trace of an image which can be brought out; but, when so employed, it is likely to make an image the high lights of which are too dense for good printing.

I recommend therefore the following formula for a glycine developer :—

Glycine	5 grammes.
Metol	½ gramme.
Sulphite of soda	125 grammes.
Carbonate of potash	,, ,,
Water	1 litre.

For a concentrated developer simply reduce the proportion of water to the twentieth of the above; but the sulphite and potash must be dissolved in boiling water and the glycine added when the solution is complete, and the heat must be kept up until the glycine is all dissolved. Then filter and bottle in small well-stoppered bottles, when it will keep indefinitely, as it does in the dilute form if the air be carefully excluded. In using the concentrated form it would always be better to use the contents of one of the bottles entire, but, if only the half is used, the best plan is to fill the bottle up with water, to exclude the air entirely. Otherwise it will not keep many days, the amount of alkali being such that decomposition is certain if the air has access to it.

A larger proportion of glycine will give density more rapidly and to any extent, but at the risk of not bringing out the delicate details in shadow. I have never been able to fog a plate with glycine alone, used according to the above formula, no matter how much it was pushed.

A 'LICENCE TO USE.'

By Gambier Bolton, F.Z.S.

Since my two successful copyright actions against Mr. Cecil Aldin, the artist, and *Lloyd's Weekly News*, I have been thinking out a form of Licence to be issued when giving permission for the reproduction of my Animal Studies, and, by the kind permission of Messrs. Valentine & Co., of Dundee, have been able to avail myself of their excellent form of Licence as a basis on which to found one of my own; and, in sending a copy of this to The British Journal Photographic Almanac, I will only express the hope that it may be generally adopted by all who have dealings with the Press, a well-known legal specialist on copyright having said that 'it is excellent for the purpose.'

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THE PAINTER, HIS CAMERA, AND NATURE'S 'HAPPY THOUGHTS.'

By Hector Maclean, F.R.P.S., &c.

Years ago, before that photography became universally available, much used to be written and talked regarding the merits of painting landscapes from written memoranda, rather than squatting down before a hill side or a river side, and spending perhaps many days in struggling with a succession of transformation scenes. As Hamerton long since wrote, 'The form of a mountain under changing light is the most unstable thing in the world, except that of a sea wave. The perception of mountain form is entirely dependent on effect. A great rough boss on the side of the mountain is its principal feature one minute, and the next you cannot find it.' Since Mr. Hamerton penned the foregoing lines, both he and probably all other artists have learnt to coquette with a camera, at the same time very few have realised that to buy prints of natural details is not the be-all and end-all of photography's aid to the artist.

If a painter read these lines, or any other individual having eyes for open-air nature, such will recall many precious memories of Nature's Happy Thoughts, which, like the flashes of wit that fall from a brilliant talker, endure in their full intensity but for a brief moment or two.

On such happy thoughts are great landscapes founded. Painters work and wait, and then half chance-like, comes a wonderful entrancing phase, an impressive harmony, at which, if his temperament be responsive, if he dare rise to the occasion, the painter will make frantic effort to record all he can of the Happy Thought.

If such a one possess a camera, which, answering to his command, will at a critical moment, as afore described, without fuss, or worry, or loss of time, set down in its own fashion some part of the admired effect, will not the artist oftentimes find the resulting record of inestimable value? As a matter of fact, he will, and does. None the less many a struggling landscape painter, who might easily rise to greater things if he could but use the camera as a stepping-stone, has voted photography 'no go.' The reason of this is that people have been led to believe that one can learn photography as readily as 'nap.' Many hundreds of artists buy a cheap set, which is expected to work wonders and never to fail, at the same time they do not acquire even a superficial knowledge of the bare elements of note-taking with a camera. It is high time such a dilettante consideration of photography should be displaced and that artists as a body be taught that they must take their camera seriously. Depend upon it, the day is at hand when photographic instruction will be considered part and parcel of the technical training of all well-equipped art students.

PACKING, FROM THE AMATEUR'S POINT OF VIEW.

By J. Vincent Elsden, B.Sc. (Lond.).

At a time when so many rival brands of plates and papers, all of excellent quality, are on the market, preference will in many cases be given to those in which attention has been paid to details, trifling in themselves, but of the utmost importance to those who study convenience and ease of working. Photographers accustomed to the luxury of a well-appointed laboratory, and who use large quantities of material daily, will not want to trouble themselves much about the way in which the manufacturer supplies his goods, so long as their quality is satisfactory; but the amateur, using perhaps a few plates, or a little gelatino-chloride paper on his travels, is put to much unnecessary trouble by the method of packing too often adopted by makers of the highest repute. It may, therefore, be useful to classify some of the common inconveniences of existing methods of packing, in the hope that efforts will be made to avoid them as far as possible.

1. *Positive Printing-out Paper.*—These papers, cut to size, are usually packed in envelopes. The envelopes are often made of inferior paper, and are too small in size. To open them, they must be torn and rendered useless; whereas it would be more convenient if single sheets could be withdrawn without destroying the wrapper. It would be also a distinct advantage if these papers could be procured cut to smaller sizes, so as to obviate the necessity for further trimming.

2. *Dry Plates.*—Those who have been in the habit of changing plates at night in absolute darkness, and relying solely on the sense of touch, would appreciate any efforts to lighten their labours. Existing boxes are often too small. When once opened for the purpose of refilling slides, it is next to impossible to pack the remainder up so that they will go easily into the box again. One of the best plate-manufacturers of the present day offends in this respect, as well as in the fact that the boxes are not strong enough to stand the strain of subsequent clumsy packing, and burst at a critical moment, leaving the amateur in an awkward dilemma. Cases sliding into one another are far superior to boxes, provided that they are made large enough to slide easily when full. Whatever means are adopted for separating the films should be confined to individual pairs of plates. Strips of paper folded so as to separate half a dozen plates are an intolerable nuisance in the dark. The smaller the number packed together the better. Boxes of a dozen plates should be divided into, at least three packets of four, never into two packets of six; six packets of two would be the ideal of convenience.

3. *Bromide Papers.*—It is very necessary that the cases in which these papers are sold should be strong and light-tight, so that not only can single sheets be taken out without endangering the rest of the packet, but also so that exposed sheets can be stored up in them during the interval between exposure and development. In packing also care should be taken that all the sensitive surfaces face in one direction. Neglect of this simple precaution has been a fertile source of failure, and the photographer has a right to expect at least this amount of care on the part of the manufacturer. It ought not to be necessary to test each sheet separately before exposure.

In conclusion, I cannot help thinking that those firms which pay attention to this simple matter of packing will speedily recover, by a large increase of business, any small additional cost which extra care may involve.

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A SIMPLE SUNSHINE RECORDER.

By F. H. Glew.

Procure an empty quarter-plate cardboard box, and in the top of the lid cut a hole, about half an inch in diameter, close to the edge of one side; then paste a bit of stiff brown paper over this hole, and when dry prick a hole in the brown paper with a pin.

To use the sunshine recorder, place a piece of paper in the bottom of the box, but sensitive side uppermost, and on this place a glass plate, to keep the paper flat. Now put the lid on, containing the pin-hole, and stand the whole thing flat on a window ledge, the pin-hole side facing the south, and make a pencil mark all round the box, so that you always place it in the same position, and change the paper once a day, when a very clear record of every peep of sunshine will be found.

WANTED: MORE BRAINS ON THE SHELVES.

By M. L. Troup.

Being short of reading matter one night, I casually took up an old British Journal Photographic Almanac for 1881, and almost at once came across a hint, which greatly helped me over a difficulty I had long been struggling to master, and my 1896 advice to your many readers is that all, whether they be photographers, chemists, or engineers, should always form a library of the books of their profession, and keep adding to it from time to time.

I was so charmed and delighted with my old volume, that at intervals I went carefully through all my old Almanacs—I have them from 1875—and the large amount of valuable reading matter they contained in the way of recipes, hints, and dodges, and the experiences of the best workers quite surprised me. It was a revelation. One often comes across an article which when published is of little or no use to the reader at the time; but let the same article be read again at some later date, the heretofore despised article has now become transformed. Since the first reading the attention has probably been directed to the matter in question, and when again turned up in an old back number the forgotten article causes as great an interest as if it had just come from the press.

Books are merely the brains of other people, and when one can pack those brains on to a small shelf—I doubt the smallness in a few years time if the Almanac keeps on swelling as it does—and use them when wanted, then I say to all photographers, Get, by either buying or stealing—the former by preference—as many back numbers of the Almanac and other photographic works as you can, and carefully go through them, and I will guarantee that the reader will come out at the end of them with a head full of photographic lore which will simply surprise and more than repay him for his outlay and trouble.

PROCESS HALF-TONE ENGRAVING AND SMUDGES.

By J. Thos. Pentney.

In casting about for a subject to write upon in response to the Editor's request for a contribution to the 1896 Almanac, I thought a few remarks on the above might perhaps shed a ray or two of light in some dark corner, even though I advance nothing strictly practical. Having screwed out of my photographic practice a few hours to dabble in process engraving, I can fully appreciate the rapid strides made in the work during the past few years, and the difficulties to be overcome to still further improve it; while, from the standpoint of a practical typographic printer, I can equally well appreciate the many shortcomings of half-tone blocks as produced commercially, and it is from this latter vantage ground principally that I pen this article, in the hope of clearing up a few smudges. It is easy to blame the poor printer for bad results, and complain of the quality of paper and ink he uses, but it may be taken for granted that, in the majority of cases, he knows his business, and it must not be always inferred that because he uses cheap paper and ink he does so from choice. Give him the opportunity, and he will invariably prefer the best materials. At the same time it needs to be understood that the extra expense of production on fine paper is something beyond the mere cost of such paper over that of a coarser quality, on account of the additional labour involved in the working. The English printer can and does produce work equal to that of any other nation, provided he is not stinted in the matter of remuneration, and, what is more frequently the case, time. Hurry and cheapness are the cause of ninety per cent. of the smudges one sees nowadays.

To obtain the *best* results from fine half-tone blocks it is necessary to work them by themselves, or, at any rate, without heavy type or other matter requiring a larger quantity of ink than the blocks. To work even a moderately heavy line of type with a fine engraving will result in an injustice to one at least, and generally to both, for the simple reason that the quantity of ink sufficient to bring up such type clear and black will fill up the finest details of the engraving, while, if the ink be regulated for the latter, then the type will go short, and present a ghostly grey instead of black. When each is printed separately, both can be made the best of, but that means double machinery and extra care in working to make the two printings ‘register,’ and, of course, extra time and expense. A minimum of stiff, fine, full-bodied ink, and hard packing to squeeze the paper on to the block, with a lingering impression to allow time for such ink to take to the paper, produces the cleanest and most brilliant proofs—all items demanding *time*. I hope this will make it clear that paper, ink, and printer’s skill are not, as so many think, the only essentials to the successful printing of process blocks.

Hitherto I have supposed only the finer grades of blocks, and these perfectly engraved, though nearly all that I have seen were much too shallow to earn that title from a printer.

As the grain increases in coarseness, so the printing becomes easier, other things being equal, and renders possible the introduction of typographic matter, cheap paper, and ink, till a stage is reached when even the coarse unglazed paper and thin ink of the newspaper office will, under some circumstances, give passable impressions.

In the majority of daily and weekly newspapers proper it is hopeless to expect half-tone blocks to work, because there even a moderately fine woodcut fails, as can be seen from an occasional one inserted by some enterprising advertiser. Outline blocks only are suitable.

This brings us to illustrated journalism, and it is here where process blocks call down most condemnation, and compare least favourably with engravings on wood.

To work off hundreds of thousands of copies in a few hours demands conditions as to materials and mode of working that will ensure that speed, and these conditions are antagonistic to getting the best out of half-tone blocks as at present made. Taking it for granted that the printer would readily alter his conditions, if possible, to meet the requirements of half-tone blocks, seeing the difference in their cost of production as against wood-engravings, the fact of his not having done so forces the conclusion that the blocks themselves are at fault. They may give excellent prints under suitable conditions, but, if they will not do so under the unalterable conditions of the rapid printer, then they are at fault, and nearly every smudge that has come under my notice I have been able to thus account for.

Note the criticisms of the average reader, and it will be found that the impressions receiving general condemnation are those flat, wishy-washy productions which, viewed at a little distance, look very much like a bad representation of a storm cloud, while those most approved have strong contrasts and clear, well-defined outlines, more resembling a decent woodcut.

It seems to me that insufficient attention is paid by process workers to the ultimate purpose of their blocks. Their photographic instinct hinders them, so to speak. Accustomed to seek the maximum of detail and half-tone gradation in their original plates, anything short of the full measure in their blocks they look upon as an evil to be avoided, even at the sacrifice of brilliancy and effect. Yet every one of them knows that a negative which would yield a soot and whitewash print on, say, P.O.P., will make quite a passable picture on rough, plain, salted paper. If they seek the reason of this, do they not find that the grain of the paper on the one hand, and the absence of glaze on the other, compensate for the missing half-tone by reducing the contrasts? Consider common ink in typographic printing as the absence of glaze in silver printing (for common so-called black ink is grey in comparison with the best), and the analogy is obvious.

As many printers have found it to their interest to eschew process blocks rather then bend further to their requirements, it behoves engravers to see if the blocks themselves cannot be made more amenable to machine printing.

Detail is admired by the public when such is produced clear and distinct, and duly relieved by lights and darks. A mass of detail buried in the granular surface of ordinary printing paper simply clouds the lights and greys the shadows, leaving a smudge which is classed with an over-exposed photograph as 'dull and smoky.' The detail is not only wasted, but is detrimental.

As at present produced, the main difference between blocks made for fine printing and those for rapid work is in the grain, and this, I contend, is not enough; for, though the details are suppressed to some extent by the coarse grain, the gradation remains practically the same *in the block;* but in the printing, owing to the necessary coarseness of the paper and poorness of the ink used, such gradation is so much lowered that, in extreme examples, the proofs present very little beyond an even tint of grey. To improve matters, resort is had to the graver and burnisher; but why not attain the same end by photography, for these tools simply add brilliancy by suppressing details?

I think if process workers would make it a rule to increase the contrast of their negatives as they increase the grain, and thus suppress unnecessary detail and enhance that which is essential, there would not be such a wide difference as at present in the general appearance of a fine-art printed block and one printed commercially, My idea is, that the exposure and development of the negative for every screen should be such that the resulting blocks, when printed on their respective grades of paper with corresponding inks, shall yield proofs *identical in effect of light and shade*, and this quite irrespective of detail.

Experiments I have made point to this end being attained better by slightly decreasing exposure of the plate, and increasing density by development, so as to block the lights, than by depending entirely on under-exposure to suppress detail. Indeed I have formed a theory that the ratio of increase of the lights (in the proof) by suppression of detail over that of the darks should be as two to one to render a correct effect. This, however, needs further consideration.

Another point which, if given more attention than is usually the case, would save much forcible English in the printing-machine room, is that, as the grain increases in coarseness, the etching should increase in depth. I have seen many coarse-grained blocks so shallow that the rollers left almost as much ink in the hollows as on the face. Nothing but smudges can be expected from such. The chief fault (from a printer's point of view) in nearly all process blocks is their want of depth or relief. To etch deeply, without undercutting and producing 'rottenness,' takes a little longer time and extra skill, I know, and there is a temptation to avoid too many repetitions of rolling-up and biting-in, but an extra quarter of an hour spent in this way will often save the machinemen several hours' work, and allow of cleaner prints being turned out.

HINTS TO LADY PHOTOGRAPHERS.

By W. M. Smith.

The first piece of advice I would offer to ladies about to take up photography is to purchase really good apparatus from one of the many makers of repute. Do not be tempted to buy a mere toy, with 'You-press-the-button,-we-do-the-rest' sort of recommendation. If you can't afford to pay a fair price, then better wait till you can than buy rubbish because it is cheap.

One of the questions most ladies ask is, What sized camera would you advise me to get? Well, this is altogether a matter of taste. If you intend making lantern slides and enlargements, then a quarter-plate camera and lens would be the most suitable. If, on the other hand, you wish to take negatives which you can print from direct, then I would recommend a half-plate apparatus as the most convenient size for ladies. Prints from quarter-plate negatives are too small to be much appreciated, and larger apparatus than half-plate is very cumbersome.

The most important part of the outfit is the lens, and this should be a really good one. If you can only afford one lens, the most suitable for doing all kinds of work is a rapid symmetrical, fitted with an Iris diaphragm. If you can afford a Ross or a Dallmeyer, by all means get one, although there are many other makers, such as Watson, Rouch, &c., who make splendid lenses at less price. Should your purse be long enough to enable you to have a second lens, buy a single long-focus one for taking distant objects, and, if you aspire to a third lens, get a short-focus one for objects in confined positions. I think, however, that most ladies will find one lens quite sufficient, at any rate to commence with.

There are many forms of cameras, varying in price to suit all pockets. I would recommend a fairly good one to be purchased. There are now so many makers of good instruments that you will have no difficulty in making a selection. Buy one with leather bellows, rising front, swing back, reversing frame, and at least three double dark slides. See that the slides are fitted with springs, to prevent them from accidentally opening. The base of the camera should also be fitted with a contrivance known as a turn-table; it is a great advantage over the old triangle and loose screw.

The tripod should be made of some light, strong wood, such as ash or hickory; those which fold into four are the most convenient, as they can be carried in an ordinary trunk when travelling. A focussing cloth will complete the field portion of the outfit. A piece of very thin black mackintosh, sufficiently large to completely cover the camera when erected on the tripod, will be found most convenient, as it not only answers for a focussing cloth, but also as a cover, in case you are caught in a shower.

The next step will be to provide yourself with a chamber, usually known as a dark room, which is really a misnomer, as it is not a dark room at all, but one illuminated in such a manner as to exclude all the actinic rays of light. It is one of the most important matters connected with photography, and on its proper construction depends in a great measure the success or failure of the photographer. There are two things things absolutely necessary; one is to realise what perfect darkness means, and the other what perfect chemical cleanliness is. Without a proper comprehension of these you will never succeed in taking good photographs. If you can command a small room or pantry, with a window in it, which you can set apart altogether for a developing room, so much the better; and, if there is water laid on, you may consider yourself fortunate in possessing the necessary material for fitting up a photographic sanctum. Put up a rod on the door, to carry thick curtains (green baize or any cheap material) wide enough to completely cover up the door, and let them be at least a foot on the floor. The size of the window must depend upon circumstances. Some persons try to work almost in the dark, but this is a great mistake. There should be plenty of light, but of a proper colour, otherwise developing is mere guesswork. A window 24 inches by 18 inches is none too large. It should be glazed with two thicknesses of ruby glass (of the proper shade), with one thickness of yellow fabric in front of it; this will give about the proper colour for ordinary plates. Bear in mind that, when using isochromatic plates, the colour must be deep ruby—no yellow or orange must be used. There are very nice sinks now made specially for developing rooms; they are not expensive, probably one 18 inches by 12 inches would cost about 12*s*. If it is not desired to go to this expense, there should be no difficulty in devising some other arrangement for catching the developer, water, &c. The tap should be fitted with a fine rose for washing the plates. The developing-room being now ready, it must be tested, to see if there are any stray rays of white light entering. To do this, completely cover the window with some opaque material, then close the door and draw the curtains; remain in the room for a few minutes, until the eyes become accustomed to the darkness, then carefully look round and see if you can perceive any light. Bear in mind that a ray coming through the smallest pinhole is just the same as if it passed through a lens with a very small diaphragm or stop, and would be the cause of sufficient diffused light in the room to fog sensitive plates. I cannot sufficiently impress on photographers the great importance of guarding against anything likely to produce fog. You can never expect to obtain a good negative if the plate has been fogged either before or after exposure. Having satisfied yourself that the room is absolutely dark, the next thing to do is to test your coloured window, to see that it is perfectly non-actinic, or, in other words, that the window absorbs the rays of light to which your plates are sensitive. The most simple way to make this test is to place an unprotected plate a few feet from the window and allow the coloured light to act upon it for a few minutes, then develop and fix it. If the whole of the film appears perfectly clear when viewed by transmitted light, your window is right. If, on the other hand, the film looks veiled, then it shows that the plate has been exposed to light which is not perfectly non-actinic, and the necessary alteration must be made before any work is attempted.

Unless you are going in for snap-shot work, I would not recommend very rapid plates, at any rate to begin with. Those known as ordinary are practically instantaneous in good light, and will be found fast enough for general subjects. The more rapid the plates are, the greater the care required in handling them. There are several well-known makers, whose plates are, I believe, equal in quality. When you have decided on what plates you are going to use, keep to them; don't be induced to dodge about from one kind to another, or you will never be very successful. each maker's plates have some little peculiarity, which you will find out by experience only.

I intended giving some hints on the exposure and manipulation of plates and printing papers, but, as I have already far exceeded the limit of a short article, I must reserve any further remarks for a future occasion.

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BY THE MERRY MOSELLE.

By Wilford F. Field.

Very delightful is life by the merry Moselle, which to-day bubbles, and eddies, and ripples along smilingly, as I write in the vine-clad arbour of Hôtel Drei Könige at Berncastle. To the photographer, be he amateur or professional, there is here an El Dorado. Go down to Trèves, and commence there your pilgrimage by the Merry Moselle. I shouldn't care to advise you as to the number of plates to take, for at every step there is a dainty bit of scenery that will pay you to carry away; and, practically, this is new ground for the photographer, but this is only a matter of time. The beauties of the merry Moselle will sooner or later yield a crop of sun pictures, so pray be in the first rank.

Locomotion is not difficult by the merry Moselle. One can travel by the steamers when the tide permits, or, for novelty, commend me to the mail cart, which will convey you in glorious discomfort for a few pence. Undoubtedly, the best way is to do the trip *à pied.*

What a Fairyland it all is! The vine-clad heights, the valleys smiling with fertility, bubbling brooks, and miniature Niagaras greet you at every step. Go to Berncastle once, and you will repeat the dose. To-day I am inclined to devote the remainder of my life to this merry Moselle city. But there are other treasures to be explored. Trabach is near, with its pretty valley of Kantenbachthal—an ideal picnic resort, where one can go and muse on Suckling's lines:—

'She's pretty to walk with,
And witty to talk with,
And pleasant, too, to think on.'

The maidens of Kantenbachthal are all this. There is Cochem near by, and Moselkern, where at the pleasant hostlerie, 'The Anker,' the merry Moselle increases its fascinations, and Brodenbach must not be forgotten, nor Alken, nor Cohern. There is no question about the merry Moselle; it is the thing to do. Do it!

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COPYING WOOD-ENGRAVINGS.

By C. H. Crosby (Chicago).

I presume most readers of your Journal who have endeavoured to copy black-and-white wood-engravings, especially reproductions of paintings, and more particularly representations of the figure, have been more or less annoyed by the grain of the paper or the hard-and-fast lines of the wood-engraving. I have found that the following method produced very satisfactory results:—

Use for the sensitive plate an orthochromatic cut film. Two negatives should be taken of the engraving, the camera, of course, being rigidly fixed, so that these two negatives are exact duplicates. They may be developed simultaneously and to precisely the same degree of density, or one may be developed to a greater degree of density than the other, as may be preferred. I am not able to say that it makes any particular difference. Having been developed and thoroughly dried, the negatives are to be properly and exactly superposed upon each other, placed in the printing frame with the sensitised paper, and printed in the usual manner. As a matter of course, the film side of the outside negative should be in contact with the back of the inside negative. Care should be taken, however, not to subject the negatives and paper to a very strong pressure; only sufficient pressure should be used to hold the paper fairly in contact with the negatives.

The result which I secured by this means is almost impossible to distinguish from a print made from an original negative, the print having a very soft appearance and being entirely free from any grain whatever.

MAKING UP METOL SOLUTION.

By G. E. Brown, A.I.C.

In making up this developer it is directed—and rightly so—to dissolve first the metol and afterwards the sulphite of soda. This order is adopted to prevent precipitation of the metol. It is, however, also necessary to have the solution of the metol cold before adding the sulphite of soda. If this point is not attended to, a solution is obtained which is clear and bright at first, but deposits after standing some hours, a crystalline precipitate consisting apparently of metol or the product of the action of hot solution of sulphite of soda upon metol. The use of cold water avoids this precipitation.

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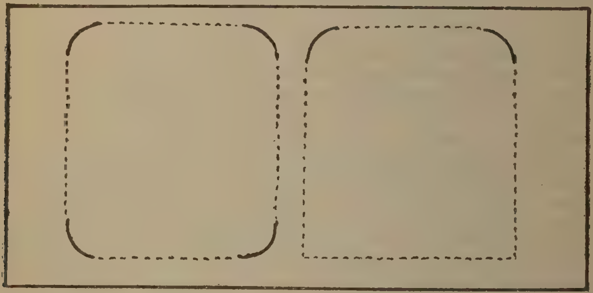
A SIMPLE AND EFFICIENT METHOD OF MAKING CUT-OUT STEREOSCOPIC MOUNTS.

By W. E. Leek.

The difficulty of obtaining stereoscopic cut-out mounts of good quality and properly cut induced me to try cutting my own, which I accomplished successfully as follows :—I procured a large sheet of good quality cardboard from the stationers for a few pence, this I cut into the usual size 6¾ × 3¾ stereo card with a sharp knife; a penknife, or, better still, a shoemaker's knife (obtainable at any leather-seller's) will answer admirably, especially if a hone is kept at hand and used occasionally to keep the edge sharp. I then commenced to cut out the openings of a suitable size, *but*—and here is a very big but—in cutting round corners I had the greatest difficulty in making a true curve with a clean-cut edge, until I hit on the following expedient, which is simplicity itself. I procured a gouge of the requisite degree of curve, and *ground from the hollow side*; with this I cut the curves at the two or four corners, as might be required for dome or cushion shape, and then with the aforesaid sharp knife cut the remaining portion from the four corners, the piece taken out serving as a guide for the second or subsequent cuttings. A glance at the rough sketch will explain fully.



A PASTE-DOWN EFFECT.

By F. J. Mortimer.

A pretty effect can be obtained when printing with matt-surface gelatino papers thus:—Cut a mask with a small cutting shape out of opaque paper, then print a little scene or figure study, as the case may be, with the mask over, on matt P.O.P. or bromide paper, and, having finished the toning or developing and washing necessary, squeegee the wet print on to the cutting shape (having first prepared its surface with powdered talc in the usual way), making the edges of the picture and the cutting shape coincide, and using, of course, the same cutting shape the mask was cut with. This will leave a white matt-surface margin, and, when the print is dry and peeled off, the effect is charming—a little glazed picture in the centre, and a white matt margin around. It's worth trying.

CASTLES IN FRANCE.

By 'Hussar.'

There is no finer field for photographing historic castles than in France. Normandy, Brittany, and Touraine, perhaps, furnish the greatest numbers. Many of them are still habitable, and have suffered little or nothing at the hands of ruthless restorers, while others are magnificent ruins, situated in lovely scenery, and nearly all are easily accessible by rail. As an enthusiastic admirer of Madame de Sévigné's charming letters, I paid a visit a short time ago to her château of Les Rochers.

Leaving Rennes, in Brittany, after a railway journey of about half an hour, I arrived at Vitré and found most comfortable quarters at the Hôtel de France. Vitré possesses a very fine mediæval castle in a good state of preservation. It contains the picture gallery and the town museum and library, and has, what castles do not often have for photographic purposes, a fine open space in front, which does away with the necessity of using a wide-angle lens.

The principal church in Vitré has a curious pulpit outside the walls, which is well worth the exposure of a plate, and there are also several old houses in the streets which should not be passed by without a snapshot or two.

The next morning I hired a conveyance—a most wonderful machine that might have been in use in the time of Madame de Sévigné, so old was it—and after a delightful drive of five miles along a road shaded by fine horse-chestnut trees, at a turn of the wall I came suddenly on the château of Les Rochers, where Madame de Sévigné wrote so many of her letters to her daughter, Madame de Grignan. Les Rochers is, I suppose, absolutely unaltered, and is a fine example of a country château in the time of Louis XIV. Descendants of the Sévigné family still live there, and the house, chapel, and grounds are beautifully kept up. In the most public-spirited way they allow visitors to see all that is most interesting, including Madame de Sévigné's bedroom, which opens out on the garden. All the furniture used by her, including a counterpane worked by the hands of her daughter, is there, and it is not difficult to imagine her as having just stepped out to speak to her gardener, M. Pilois. No difficulty was put in my way as to taking photographs, and I managed to carry off with me a dozen views. Many châteaus suffered much in the great Revolution, but Les Rochers passed through it unscathed. It is said that the then owner had a very good cook, and during that stormy period he constantly invited the revolutionary authorities at Vitré over to Les Rochers and fed them 'like turkey cocks.' Consequently he was considered a good patriot and a man not to be interfered with.

After leaving Vitré, I went, *viâ* Le Mans, to Tours, which place I made my headquarters. Of course, while there, I paid a visit with my camera to Plessis-les-Tours, just outside the town. It was Louis the Eleventh's favourite abode. There is very little left of it except one block containing the guardroom of the Scottish archers on the ground floor, and the room above, where Louis died. Sir Walter Scott, it will be remembered, described the castle in *Quentin Durward.* The place has now been turned into a sewage farm.

From Tours I went over for the day to Chenonceaux, where there is a magnificent castle, formerly belonging to Diane de Poictiers, who exchanged it for another castle with Catherine de Médicis. It is in very fine preservation, and is inhabited. It is built on arches over the river Cher. Rooms are shown which were used by Mary Stuart and her husband, Francis. A rich Mexican gentleman has, I believe, lately purchased the place. Visitors are not allowed to photograph the interior, but a full permission is granted to take as many views as you like of the outside and the beautiful grounds. Three hours I found none too long for this.

Another day I went over to Loches, one of Louis the Eleventh's favourite prisons. It is still used as a house of detention. The keep is a ruin, but in another part of the fortress many awful oubliettes are shown, which are, of course, unphotographable. A plate might be exposed in the torture-chamber, as there would be sufficient light for the purpose, and, moreover, the room is large. It contains a curious fireplace which was used for heating irons and boiling the oil, which was poured on the soles of the feet of the wretched accused. A horizontal iron bar a few inches from the ground is still in existence, which was used to fasten the feet of those who underwent the above torture. A room upstairs formerly contained the iron cage in which Cardinal de Balue was shut up for eleven years by Louis XI. Another room was the prison of Ludovico Sforza. It is covered with frescoes done by his hand to wile away the dreary hours. A photograph of this would require magnesium light, as it is very dark. I fancy a tip to the obliging warder would make this easy. I did not, however, attempt any inside work, but took several views of the exterior. On the south side there is a road commanding the outside of this gloomy old prison, from which the best exposures can be made.

The interior of the church inside the walls of the upper town is worth a plate.

On the way up the Loire from Tours the next place is Amboise, with its castle, beneath the walls of which many hundreds of Huguenots were slaughtered by the Duc de Guise in the presence of Catherine de Medicis and Mary Stuart—an unwilling spectator; and further on is the Castle of Blois, where the Duc himself was murdered. A couple of days may be well spent here, and a large stock of negatives secured.

Before leaving this part of the country, the Castle of Chaumont should be seen, and on the passage down the Loire, before you get to Nantes, there is the Castle of Champtree, noted for being the abode of Bluebeard. The tower is shown on which Sister Ann stood watching. Bluebeard was a reality, and was righteously put to death after trial at Angus, a few miles distant.

In conclusion, the country abounds with splendid subjects for photography, and I cannot recommend any one to do better than to spend a fortnight or longer in this delightful country.

MOUNTING PRINTS BY THEIR EDGES.

By W. G. Stretton (Rangoon).

My last communication to the Almanac referred to mounting bromide prints in 'cut-out' mounts by their edges direct on the edges of the mounts, so as to dispense with paste in the body of the print. Since then I have successfully adopted the method when mounting on plain and 'plate-sunk' mounts, and I am so pleased with it that I would strongly recommend all mounting to be done in this way, as being much easier and quicker to work (more especially in the case of the 'plate-sunk' mounts) than the usual way, and not half as messy. A short *résumé* of the process may perhaps be useful to some of your readers.

We all know by experience that, if we paste or gum round the edges of a dry print, they will wrinkle and pucker up to such an extent that it will be impossible to make the print lie flat on the mount, for the simple reason that the edges are *wet* and the rest of the print *dry*. The secret of mounting by the edges is to render the *whole of the print uniformly moist*. This is easily effected by floating the prints, face up, in a dish of water (or it may be placed on a piece of blotting-paper, saturated with water) until it lies flat. The print is then drained, surface water blotted off, and left to dry a little. In the mean time another print may be soaking. The print being now a little larger than it was in its dry state, it will be as well to mark its position on the mount by pencil marks at the top and left edges of the print. This done, the edges may be pasted round for about a quarter of an inch with any good mountant. It is now taken up by the right top and lower left corner, and lowered carefully on the mount into position, or as near as possible. Should it be a little out, it can be easily *worked* into position, there being no paste in the body of the print to take the mount and give trouble. It is then rubbed into close contact, a sheet of clean blotting or other paper being laid over it.

As the prints are finished, they are stacked one on another, leaving a space between each to facilitate drying by placing thin wooden battens on the mounts at the ends, and on the battens a glass plate, the whole being weighted down by a weight on the topmost plate. They dry in half the time in this way that they would if stacked in a solid mass, and the plates ensure their drying absolutely flat.

This is how I mounted for a friend the other day half a dozen 10 × 8 bromide prints, on plate-sunk mounts, intended for the Calcutta Exhibition, and four of my own exhibits, and they were a pleasure to look at when finished, the prints lying flat on the mounts, it being difficult to wrinkle them even when bending the mounts inwards. The mounts also were without a semblance of a cockle, being as flat as when taken from the packet. It will therefore possibly be as well to make use of a 'support' mount with 'cut-out' mounts when mounting by this method.

MISHAPS AND HOW TO REPAIR THEM.

By T. Perkins.

Sundry mishaps are likely at times to befall even careful workers, mishaps that, unless the worker has a certain amount of resourcefulness in himself, or has heard how others have got out of similar difficulties, will prevent the exposure of a plate; and these accidents are almost sure to happen when the photographer is far from home and is anxious to photograph some subject which he will not have the opportunity of visiting again.

For the benefit of others I will mention some of the accidents that have befallen me, and the means by which, notwithstanding them, I managed to secure the negative I wished.

The focussing cloth has been forgotten or lost on several occasions. However, its place was easily supplied by my coat, taken off and put over the camera. More serious was it when, on one occasion when on a visit to London, I had sallied forth at 5 a.m., before any of the servants were up, latching the door behind me, so preventing any possibility of re-entering the house, in order to get some pictures of St. Paul's and other public buildings before the streets were thronged, I found that I had left the Waterhouse diaphragms behind me. Fortunately I had a visiting card and a knife with me, and so was able to cut out a temporary cardboard stop, and pierce it with a hole approximately of the size I wanted. It answered its purpose well. If I had not had a card, I should have folded up an envelope (one almost always has a letter or two in one's pocket), and made a stop out of this

Once or twice I have lost a cap. I have then folded the focussing cloth two or three times and hung it over the lens, thus preventing any light getting to the plate until the time for exposure came, when I simply removed the cloth for the necessary time, and then replaced it over the lens.

Once, when I had separate fronts to carry the lenses (I now use a series of adapters, which is a much more convenient plan), I found I had left one of the fronts behind me, and the subject necessitated the use of a lens which would only fit the flange on that front. If I had been alone, it would have been a hopeless case; but I had a friend with me, who held the lens against a flange which it nearly fitted so as to exclude all light, and thus I was able to focus and make the exposure.

If by any chance two exposures have been made on one plate, the other in the same back not having been exposed, I have generally found that the unexposed plate is the one that gets into the developing dish first. If I was quite sure that the exposure I intended to give it was sufficient, and no image appeared after a reasonable time, I began to suspect what had happened, and poured off the developer, washed the plate, and put it aside in a dish of clean water, while an attempt was made to develop the other plate. If this proved to have been exposed on two different views, it was worthless, but the other non-exposed plate, notwithstanding the attempt to develop it, would not be ruined if it were washed carefully, drained, and set up to dry in the dark. It might when dry be used for a fresh exposure, but its sensitiveness would be greatly reduced, and it would require three or four times the ordinary exposure.

Once the chambermaid at an hotel in the heart of the New Forest upset my camera and broke the focussing screen into many pieces. She was profuse in her regrets, and offered to pay for the damage. I had to explain that it was not the value of the glass that mattered, but the impossibility of taking any photographs, which had been the object of my visit, unless something could be done. I asked if she could get me some paste and brown paper, and with these I managed to patch up the screen so that with care it was usable. Had I failed to do this I should have taken an unexposed sensitive plate and put this in the place of the broken glass. When once a similar accident happened at home, I took a waste negative, cleared off the film, pasted some tissue paper on it, oiled it, and used it until I could get a new sheet of ground glass.

The last mishap I have to record is the loss of a tripod head screw. I had fastened it by string to the tripod, but in getting through a hedge it caught, the string broke, and the screw could nowhere be found. This was a serious matter, as I had taken a long railway journey on purpose to do some architectural photography. It however occurred to me to cut a twig from the hedge rather larger than the screw, and, as it was soft, I screwed it into the camera through the tripod head, so that a thread was cut on it by the thread of the hollow screw on the camera. It made the camera firm, but it was fastened in so tight that I could not get it out again, so I had to carry the camera home attached to the tripod, and next day, the damp wood having shrunk by drying, the temporary screw was easily removed, and its place taken by the brass duplicate I had by me.

GRADATION OF LIGHT IN LANDSCAPES.

By H. J. Channon.

It is rather a remarkable fact, considering the activity of scientific investigation at the present time, that there is still very great uncertainty as to the question of what range of intensities may be expected to be found in the light from the various parts of an ordinary landscape. The differences of opinion which exist on the subject are, in fact, so great that the probable ratio between the brightest and darkest parts has been estimated by different writers of good authority by as widely varying values as 1 : 8 on the one hand, up to 1 : 8000, or even to an infinitely large ratio, on the other. As, therefore, this matter, which is one of much interest to the artist and the photographer, seems in so decidedly unsatisfactory a state, it may perhaps be worth while to briefly examine the principles underlying it, and the teaching of such experiments as have been made.

The amount of light received from any particular part of a view depends principally on two things—firstly, on the proportion of light reflected by the material which happens to be situated at that place, and, secondly, on the intensity of the light by which it is illuminated. In regard to the first matter, we are enabled to form a very fair judgment, as Captain Abney and others have found that platinum black, or lamp-black, reflects from three to five per cent. of the proportion of light which is reflected by white paper, and these materials may fairly be taken as types which about represent the lightest and darkest objects likely to be found in ordinary landscapes. This difference of only one to twenty, or one to thirty, in the intensities of the light, when reflected under identical conditions (Professor Church increases it to 1 : 125—*i.e.*, he finds that lamp-black reflects only ·8 where white paper reflects 100), seems rather surprisingly small; but the other factor in the question, the variation in illumination, will be found to show differences which are by no means small ones.

The brightest light to which any part of a view can be exposed is uninterrupted sunshine, together with light reflected from the whole hemisphere of visible sky. The sunlight has been estimated as equal to three times the whole of the reflected sky light, but is probably sometimes much less. Various gradations of smaller intensity are found, where the direct sunlight is shaded off, and more or less of the sky light obstructed. Perpendicular objects in shade can, at most, receive light from only one half of the sky, but another source of illumination, although a weak one, has to be mentioned, which will generally make a little addition to that. I refer to the light reflected from terrestrial objects. Now, any point in a landscape, wherever situated, can only receive light from the three sources which have been referred to, and it may evidently happen to be so placed that the surrounding objects may obstruct the illumination to any extent; all light from the sky, as well as the direct sunlight, may be wholly lost, and that coming from the remaining source diminished almost without limit. Open doorways, nooks among foliage, and, generally, openings to hollow places, make the darkest spots in a view, and, the smaller such openings are, the less light is likely to enter or to be reflected from the interior. Now, in landscapes, we sometimes have the lightest material illuminated by the brightest light, and the darkest material by the weakest light, and, from what has been mentioned above, it consequently appears that the range of gradation may be almost unlimited in extent. Those writers, then, who have given the highest estimates, seem the most likely to be correct.

The few experiments bearing on this subject, of which particulars have so far been published, do not, it is true, support this theoretical conclusion by proving the existence of very wide ranges of intensities in the cases examined. One of the latest was made by Captain Abney, who recently found, photometrically, a range of 1 : 90 in a view in the Brompton Road, but under conditions all favourable to flatness. I will also mention a rather unsatisfactory experiment of mine, described in THE BRITISH JOURNAL OF PHOTOGRAPHY of August 4, 1893, in which I found fair evidence that the light reflected from one portion of a certain view was of decidedly less than $\frac{1}{136}$ the intensity of that from the sky, which was regarded as being the brightest part of the subject. A later experiment, made under far more favourable circumstances, and, I believe, trustworthy, showed a range of from one to a trifle under three hundred in the same view. (It should be mentioned that these are photographic intensities.) The failure to show any very large differences in intensities by the methods of measurement which have been employed can, I think, be easily accounted for. The really darkest spots in a landscape are naturally small in extent and scattered, and can only cover small spaces in the view; they represent the small cracks and openings into which little light enters; but, in order to satisfactorily examine the intensity of any particular part, either by a photographic or other photometrical method, a fairly large area must necessarily be included, and any surface large enough to be measurable cannot fail to be exposed to a strength of illumination far exceeding the probable minimum. No doubt there are landscapes in which the range of gradation is confined to a small scale, but, on the other hand, the points I have mentioned lead to the conclusion that in some others the extent of the scale may be almost unlimited As regards photographers, this points to a further conclusion very favourable to the use of plates which have the widest possible range of sensitiveness.

PHOTOGRAPHY AS AN AID TO STUDY.

By Richard Penlake.

Perhaps in the distant future the managers of scholastic institutions—Grammar schools, Technical colleges and Higher Grade Board schools especially will awaken to the immense advantage of including a course of photographic tuition in the curriculum. One or two enterprising institutions, notably the London Polytechnic and the People's Palace, have provided such a course with encouraging results. In the mean time however, I venture to suggest to students the advantage a photographic knowledge would be to them, not only in after-life but even while at school or college. Even regarded from the lower standpoint of a pleasurable hobby or pastime, photography is well worth taking up; but, if undertaken in downright earnest, it is bound to prove, in addition to a constant source of amusement and delight, of very great utility in studying the arts and sciences.

It is the object of this article to point out to those who are sufficiently interested in the matter to take heed, how such a knowledge will serve the possessor in the attainment of other information, likewise to indicate a few of the ways in which photography has rendered invaluable service to mankind, and completely revolutionised much of the teaching of the older schools.

The past history of the photographic art-science is one of almost super-human progress, excelled probably by no other invention of any kind in the history of the world. Since the time when Daguerre published his process, to which he gave the name of 'Daguerreotype' and by means of which 'nature would henceforth depict her own likeness with a pencil of light,' to the present day, many of the world's distinguished men of light and leading have given to photography ungrudging service and have brought it to its almost perfect condition.

The future of photography is absolutely boundless. Already it is spreading with marvellous rapidity into every part of the habitable globe. It is the handmaid of science, and a useful adjunct in many departments of industry To the traveller and explorer it is indispensable, recording as it does truthfully the scenery which perhaps never before has man gazed upon. In the lecture-room, laboratory &c., it is fulfilling a useful mission. Photography has even penetrated the sanctuary and temple, and by means of the optical lantern has been made the *vade mecum* of useful teaching to thousands.

To the astronomer photography has revealed countless heavenly bodies altogether beyond the grasp of the most powerful telescopic instrument, and has registered upon the sensitive plate indelible records of undreamt of worlds. It has focussed the lightning flash, marked the courses of planets, and registered the movements of comets. Skilfully employed, photography is a great power in the hands of the student of the solar system, facilitating his studies in many ways.

By the aid of photography the micrographist has wonderfully enriched our knowledge of bacteria, germ life, &c., and has furnished lifelike illustrations exceeding in truthfulness and detail anything the most skilled draughtsman could produce.

In the surgical rooms of our large hospitals and infirmaries, photography is rendering invaluable aid in the proper treatment of surgical operations. For upwards of a quarter of a century photographic records of deformities, dislocations, tumours and operations have been systematically produced which have had the merit of demonstrating the advantage or disadvantage of different methods of treatment, the *raison-d'être* of certain modes of procedure, and the chronicling of mistakes and successes that have served as guide or warning in future cases. For this reason the photographic enthusiast claims that his beloved art-science has done not a little in alleviating human suffering.

Photography, as applied to book illustration, is a rich field of promise to young students possessing technical skill and ability. The woodcut is dying out, the art of the engraver and draughtsman is now but in small demand. The sun picture, which has ousted the wood engraving, is truer to life and nature than its predecessor, and, as turned out by some of the best firms, is rich in detail and beautifully graduated. Produced as they are at a tithe of the expense of first-class wood-engravings, no wonder they have scored such a victory over their rivals and still further developments may be expected. In this one branch alone hundreds of earnest workers are at present employed in experimenting with a view to still further enhance the value of photo-process work. There can be little doubt that the next few years will witness even greater improvements and that the pictures in books and better-class magazines will more nearly approach real photographs in general appearance than anything that has hitherto been attained.

Flashlight photography has been of infinite service to workers in mines and underground situations. In places where not the faintest ray of sunlight lights up the gloom, where everything is 'black as blackest night,' by means of camera and magnesium, photographs full of detail and equal to many obtained under normal conditions have been secured.

Technical instruction books, and even some of the popular magazines, have familiarised us with the interiors of caves, mines, underground cuttings, &c., all obtained by reproductions of flashlight photographs, which serve to give the outside world a good idea of the appearance of such places.

The student of chemistry and optics will find in photography the opportunity of reducing into practice much of his knowledge; it is a capital training ground, in the dark room manipulation of the sensitive film impressed with a latent image he will find abundant scope for studying the action of various chemicals and reagents. The number of chemicals employed in pure photography is an ever-increasing quantity, and there is scope for the experimentalist to add still further to their number and utility. In mastering the action of lenses under varying conditions of light and shade, of distance from subject, the action of diaphragms &c., the student will bring into play all the optical knowledge of which he is possessed and add to the store. Thus photographic chemistry is bound to be of service to the student of organic and inorganic chemistry, and is also calculated to whet his thirst for knowledge.

Artists frequently use the camera for the basis of portrait work, and often employ it for securing correct representations of landscapes, seascapes, mountain scenery, &c., which they intend to depict on canvas in all the colours of nature. By means of a photograph a picture is often obtained with pencil and brush impossible to be secured without it. Even in photographing, pure and simple, the art faculty in one is often stimulated to the full. A photographic outfit is indeed a capital source of profit to the art student, by its aid he can become possessed cheaply of reproductions of eminent masters for purposes of study. Even in his walks abroad he can train his eye and mind by conjecturing scenes of picturesque beauty for picture-making and then test his judgment by photographing such scenes on the spot.

Fascination is added to travel by means of the sun picture as thousands of albums possessed by amateur photographers abundantly testify. Photographic souvenirs of places visited, of important historic scenes and buildings, even of men and women, are the proud possessions of many camerists, who value them a thousand fold more than those purchased from printsellers, for are they not the work of their own hands?

To particularise the advantages of photography to the student in all the channels in which it might usefully be employed would demand more space than at my disposal as likewise exhaust the readers' patience. Enough has been said to show that, in the hands of earnest workers, photography is not only a source of much pleasure but of great profit also.

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ON TONING P.O.P. BY THE SULPHOCYANIDE BATH.

By Francis G. Eliot.

Notwithstanding the able directions given by the Ilford Company in every packet of their P.O.P., amateurs are constantly asking the editors of the journals for information as to the cause of their failure to secure good results. Now, I believe this is due to the directions of the Company not sufficiently insisting on those minutiæ in working which being different to the customary method of the process used with albumenised paper, makes all the difference between success and failure. We will therefore go through the working from beginning to end, and show how success is perfectly certain.

First, with regard to washing, the Ilford Company say in several waters for fifteen minutes; but the question is how much water to a given number of prints, and how many changes are absolutely necessary. Now, each shilling packet of paper, although differing in number according to the sizes, will be found to contain in the whole packet nearly the same quantity of square inches of paper, so we will give the quantities of everything required for each single packet. Use then a dish that will hold easily one gallon of water, put in the contents of one packet in prints one by one; when all are in, bring the first ones immersed to the top of the dish, and, when they cease to curl, turn the water off and put on another gallon, let them stand two minutes and change again; do this eight times in all, lasting rather more than fifteen minutes, and the prints are ready for toning. Now, the Ilford Company advise soaking in alum before toning; I do not quite agree with them in this, it very much hinders the toning, and with care in handling the prints I have never found any trouble without.

The next thing is to have the sulphocyanide bath in good order. It is recommended by the Ilford Company to use 30 grains of sulphocyanide of ammonium to 2 grains of chloride of gold; the Eastman Company for their paper say 20 grains of the former to the 2 grains of gold. If the best chloride of gold is used, containing at least 7 grains of metal in the 15 grain tube, the Ilford quantity of sulphocyanide works well; but, if any inferior or cheap tubes are used, the Ilford Company's quantity of sulphocyanide is too much, and the Eastman Company's is better.

It is no use buying 15 grain tubes of gold chloride at 1*s*. 3*d*. each and expect them to contain 7 grains of metal. The coin of the realm is the value of the gold, and it cannot be purchased for less; and, as there are 56 grains of pure gold in each half-sovereign, which divided by 7, the amount of metal there ought to be in each tube, gives 8 tubes for 10*s*. or 1*s*. 3*d*. each, without allowing for a ids and cost of manufacture; it is not a by-product, therefore cannot be sold at cost price.

Make then stock solutions of sulphocyanide of ammonium 30 grains to the ounce, and gold chloride 15 grains in 15 drachms of water; of this, pour 2 drachms of the latter into 1 ounce of the former, which will turn a deep brick colour; pour on 5 or 6 ounces of boiling water, which will make a colourless solution. After standing fifteen minutes, make up to 16 ounces with cold water; can be used directly it is quite cold, or can be made the day before using, and will keep for some time in a cool place. Now comes a very important part, never let any white light get on the prints when once they are in the toning bath, not even to examine them for a moment to see the change of tone; light that has no effect on albumen prints in the acetate bath will quite degrade and brown the whites of a gelatine print in the sulphocyanide bath; keep the room dark or with a ruby light, and examine the prints either with a gas or paraffin lamp, wash in clean water when toned, and fix in hypo as directed. In toning, it is best to keep the prints face upwards, and to use the amount of bath according to the number of prints in the above proportion; never add to the bath, but, if the prints will not finish off, pass them through water and into a fresh bath, when they will tone as fast as at first. After well washing from the hypo for several hours in running water, place in alum solution ½ ounce alum to 20 ounces of water for five minutes, well wash again and hang to dry. Let the prints get thoroughly dry, and prepare your glasses for squeegeeing; clean and rub well with French chalk powder with a ball of cotton-wool, and polish off with wash leather, then soak the prints for ten minutes in clean water, and bring in contact with the chalked face of glass under water and set up to drain; when the back of the print is surface-dry, place three or four sheets of thick blotting-paper on them and squeegee well down, let dry, and the prints will almost drop off the glasses I have placed them in the window in the hot sun, glass to window, and found the prints drop off on the ground; I have even held the glasses in a good hot oven without the slightest harm, the prints curling off when thoroughly dry; by following this course success is certain.

NOTES ON ANIMAL PORTRAITURE.

By W. Girling.

A most interesting study, full of go, venture, and the employment of every good quality in human nature. For the best effects, a holiday in the country is required. They cannot be obtained to order; one must go into the fields, lanes, and meadows, by the copse, along the brook, and on the river, &c. Choose a fine, calm day, when you can lie on the grass and read, smoke, or chat, while waiting for the favourable opportunity.

You must be quiet, careful, cautious, patient, and persevering, quick to perceive and prompt to act.

It is well to remember the different ideas conveyed to the mind by the various animals, endeavouring to have the surroundings in harmony. Sheep will suggest quiet, restful, peaceful thoughts. Lambs, on the contrary, are frisky, playful, buoyant, hopeful; therefore do not photograph them with things incongruous—for instance, lambs gathered in a pen or yard, with two or three butchers looking on. Oxen give a well-to-do look to a picture, something substantial and of real worth—a wealthy appearance; let them have a good expanse of pasture and large trees, to give the idea of magnitude.

A herd of deer always gives a very refined ook to a photograph. Let the trees be of a graceful character, water, with a swan, a mansion, and park-like appearance, the whole scene bright, light, and airy-looking.

As to horses—ah, well here you have 'a foe worthy of your steel.' Beautiful in form, most graceful and harmonious lines; life, vigour in action, full of energy and power, sensitive to the highest degree. Look at his eye, his ear, his nostril. Can you get them? Try. You will find it very difficult; but be patient, hopeful, persevering. Pay but little heed to a few failures, except to teach you better. Remember a good picture of a good horse is an achievement to be envied; few can get it, but it's worth having, and worth all the pains and trouble taken to obtain it.

So much has been written upon the *modus operandi* that I need not repeat it.

If you can secure the help of one accustomed to them, do so by all means; they flee from strangers. When you see a picture of them you would like to have, get your apparatus ready somewhere unobserved by them, the other side of the hedge or wall; approach them quietly, adjust the focus, draw the slide, give a short whistle or bark to make some of them look up, then take it in a moment. Let the horse smell of you, look him kindly in the face, pat him gently, speak to him (they understand the tone of voice better than most people do), make friends with him. An attendant should be near you a little to the side the head is pointing at; get him to attract the attention of the horse while you photograph him, not in sunlight, or you will have a patchy appearance in the picture, and the flies are more troublesome. I feel sure that a vast amount of intelligent enjoyment is afforded by living creatures of whatever kind, more difficult, but far more pleasurable, and of more worth afterwards; each one will have some tale of adventure connected with it.

I have had several narrow escapes, sometimes a fall, and a smash up, twice nearly drowned. Not long since I saw a fine old oak, with some cattle near by, a cottage, and a bit of the road. I always want to photograph a pretty scene. During the unpacking, &c., the bull slowly moved away, to my regret, walking quite out of the field of view. Some of the cows followed suit; a few remained, but were too far off. I went into the meadow to drive them nearer the camera, but they wanted to join the others. I shouted and gesticulated, and endeavoured to get them to the desired position, but they would not be obedient. I tried milder means, sought to lure them by handfuls of grass, but all to no purpose. At length one of them, with sharp-pointed horns, felt she had enough of it, lowered her head, and came at me. I had just time to think, Here I go up in the air, I suppose, when I seized the near horn, and succeeded in diverting her head from me, only receiving a heavy push from her body. I photographed that cow from the other side of the fence, and she looks well. This shows the use of a native acquainted with them and their peculiar ways; but, speaking in a general way, there is but little trouble and risk with them.

This kind of work necessitates open-air exercise, is most conducive to health, invigorating to both body and mind, making both sound, a consummation devoutly to be wished.

WINTER AMUSEMENT.

By Charles Stephens, M.A.

I believe a good many amateurs put away their cameras and all apparatus as winter approaches. This, I maintain, is a great mistake, as on many occasions a casual subject offers itself even in the depth of winter. To mention one only, I have long been in the habit (as, no doubt, many others have) of putting out crumbs for the birds in severe weather, and it occurred to me one winter that this benevolent action might provide food for the camera as well as the birds, and this is 'how it's done.' I place an inverted box about twenty feet from the window, which should be of plate glass and very clean. Any snow which may be on the ground is swept up into heaps round about the box, the top of which is covered with crumbs, and a sprinkling of the same, with a bone or two scattered about, in the snow, and a pan with some water placed near the box. There will very soon be a gathering of all sorts of birds ready to be *shot.* We usually muster two robins, a thrush, and many starlings and sparrows, while some rooks regard the proceedings at a respectful distance, making an occasional dash for a morsel.

Inside the room I set up my camera, focus on the box, and, with a long tube attached to the shutter, sit down to breakfast or lunch, ready for a snap at any moment. I need hardly say that both plate and shutter must be very rapid. Should a long tube not be available, one may stand behind the camera without disturbing the subjects. The best light is when the sun is shining at about right angles to the window. I can recommend this little amusement to any one who has the necessary means available, the most important item being a good plate-glass window; and, at all events, any one may feed the birds, if he cannot *shoot* them.

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HAND-CAMERA WORK WITHOUT A SPECIAL CAMERA.

By William Fleming.

With many photographers a good hand camera is now considered an essential part of their outfit, and the pleasure to be derived from such an instrument, when judiciously used, fully compensates for the extra trouble involved in its use.

Unfortunately, however. a first-class hand camera costs much money, and on this account many less fortunate ones are debarred from the pleasure of instantaneous work. The object of this short article is to show that it is not absolutely necessary to have a specially constructed hand camera for the fascinating art of instantaneous photography.

All possessors of a good quarter-plate camera and lens, and a few dark slides, are quite in a position, by the aid of the rapid brands of plates now on the market, to engage in almost any kind of hand-camera work; and certainly those who go in carefully for the much-abused art of 'snap-shotting' will not regret the extra expenditure on plates and chemicals.

A portable quarter-plate camera, such as the Instantograph, may, with very little outlay, be used for hand work. In the first place, a simple view-finder is required, and should be movably fixed to centre of camera in front of swing back, or on front portion of camera above lens, by means of a small brass plate. The former position is usually the most serviceable, and, when fixing, care must be taken that the plate for holding finder is screwed accurately in line with the centre of lens.

Focussing cannot very well be conducted with the usual cloth, therefore it is necessary to have clearly marked on the brass slides of tail board the various distances at which the camera is in focus; say eight feet, twelve feet, and twenty feet. With a lens of about five and a half inch focus, such as the Instantograph lens, working at *f*-10, all objects beyond twenty feet will be pretty well in focus, and, with the lens working at *f*-16, all objects beyond sixteen feet will be in focus. The distances should be clearly marked on the brass by means of a graver or other sharp instrument. Care must be taken that this is done accurately, as the sharpness of the negatives will, of course, depend thereon.

A leather hand strap for carrying may also be fixed, by means of two small brass plates, to the top of camera. This strap facilitates the carrying about of camera, and in good weather there is no necessity for a camera bag of any description. With lens and finder in pocket, and three or four dark slides also stowed about the person, the owner is fully equipped for a long summer afternoon's work.

With an Instantograph camera, arranged as above described, the writer has been enabled, during the past season, to secure many negatives which he would certainly have lost had he been obliged to depend on the tripod and time exposures.

Now a word or two in conclusion against that phase of instantaneous photography which has earned for amateurs the euphemistic sobriquet of 'Camera Fiends.' What is referred to is the promiscuous 'snap-shotting' which goes on at holiday resorts on all occasions. Do not degrade our beautiful art by practising it to the annoyance of other people. Subjects innumerable there are for the exercise of our skill and judgment, without giving offence to any one. A more objectionable being does not exist than the man who, having invested in a hand camera —cheap or otherwise—persists in prowling around, seeking for subjects whom he may photographically devour. Practise the art for art's sake, and do nothing which will lower it i the estimation of our fellow-creatures.

AN OBSERVATION OF THE COMPARATIVE DURABILITY OF NEGATIVE VARNISHES.

By W. Hanson.

Having had occasion recently to destroy about a ton weight of negatives, which were made during the period between the years 1860 and 1890, I noticed that those of them which had resisted the damaging effects of time and other influences most perfectly were such as were protected by a varnish, composed mainly of dammar resin dissolved in benzole, and tempered with suitable gums and a little castor oil, prepared by my then friend, the late Mr. J. W. Ramsden. Thinking this fact, if made known, might be of use, I send a note of it in response to the Editor's kind invitation to contribute something to The British Journal Photographic Almanac for 1896.

DUST ON PLATES, AND ITS ORIGIN.

By A. Lévy.

When, after exposing a plate or film of any size, the resulting negative is printed from, a few dust specks, or, maybe, some other little defects, are of little moment, since they are generally of such a small size as to be seldom detected with the naked eye. Nowadays a good many persons, professionals or amateurs, try to take sharp negatives of a small size with the intention of having them enlarged. In such a case, a speck or small dust which is unseen in the original, becomes painfully apparent when enlarged to two or three times only its original size. It would be, therefore, a good sentence to add to advertisements for rapid plates, 'also free from dust and other specks.'

Of course manufacturers will always say, when complaint from dust arises, you must dust your plates before exposing. While this is almost impossible for a view or landscape photographer to do, so as to get rid of dust accumulating during transportation in the holder, the remedy as given may not, and probably is not, as effective as said to be by the manufacturer. The film is at all times highly electrical, and I think that the brushing of it to get rid of loose dust may just as well generate enough electricity to attract objectionable dust. So much for the brushing or dusting as recommended.

Any one interested enough in avoiding all defects in a plate which he intends to enlarge from has probably scrutinised rather carefully one or more of his negatives with a powerful magnifying glass or a good focussing glass. Such a party will surely have detected on his negatives, and in rather large quantities, dust specks, which are black on the negative; also a few round black specks, and a few pinholes, as well as a few white or transparent dust specks. It will be apparent to any one, upon a little reflection, that the only dust speck which can be removed, or is the fault (if any) of the photographer, is the one which shows on the finished negative as a transparent crooked line. This dust has settled *on* the film, and during exposure obstructed the light, hence a transparent spot. When looking at the negative, one can easily also see that the dust showing as black retains the dust particle imbedded in the gelatine, and no brushing can eliminate this, as it was in the emulsion while the plate or film was coated with it, or settled upon it during manipulation, and before drying. All this can be seen with a magnifying glass, and the trouble laid at the door of the manufacturer, who always and again says brush the plates, but never wants to admit his defects, however apparent they may be. Some plates have this defect less than others, and I knew of a manufacturer in America who used to filter all the air admitted in his coating and drying department through an immense canton flannel tube, and his plates were, as a consequence, remarkably free from defects. If the dust specks showing black could at all be eliminated before exposure, they would certainly not show on the finished negative as black lines after the brushing given to eliminate air bells, and all the washing a plate is subjected to from the start until ready to stand up to dry.

The same may be said in regard to air bells, which the manufacturer will always say is not his fault, and yet one may develop a plate, using all the care recommended, and yet have air bells showing in the finished negative as perfectly transparent spots, or a very thin fim. This may arise from air bells contained in the emulsion while coating the plate, and which burst during the drying of the gelatine, leaving clear glass, or a very thin gelatine film on the glass.

In writing the above I do not pretend to give a cure for dust or air bells, but I want simply to show that the photographer has not always himself alone to blame, whatever manufacturers may say to the contrary.

To conclude, I will add one or two practical items :—

To obtain albumen prints flat, they may be dried on a piece of linen, face down. This I prefer, especially for large quantities, to drying between blotting paper, which remains very long damp.

When photographs are intended to be mounted at some future time, they will lay flat in the water very much easier if they have been rolled up a day or more previous.

Paste I find to spread easier and more evenly if allowed to cool first, and then strained through a fine sieve.

May I be allowed to express here a wish, which I think would meet with the approval of a great many excursionists, and particularly with bicyclists, who want a light and compact camera which may fit inside the frame. I want to see an advertisement offering at a reasonable price a camera to take views of any size from 7 × 5 down to quarter-plates, the camera to be less than three inches thick when folded, and weighing between two and three pounds, and no more, including all screws (brass) and one double slide, with or without the tail board, which may be fixed to the camera when needed. The camera should have a rising front board, cone bellows, extending at least twenty inches, and a swing back. The back should be square, so as to allow reversal of plates. The outside measure must not exceed eight inches for a 7 × 5 plate.

However difficult this result may seem to be, it can be done easily. I have made one such camera for my own use. It works very well, and, should any one feel inclined to undertake the manufacture of similar ones, I will give him all necessary explanation.

CAMEROPHOBIA.

By John Dormer.

Camerophobia will soon be added to the other 'phobias' on the medical roster. It is a very depressing malady. Its symptoms are most marked when the patient is out of doors. He betrays a general lack of ease, glances furtively and continuously in all directions, shivers, and endeavours to moisten his throat when any one bearing a parcel approaches, and undergoes, generally, rapid alternations of hope and despair. When you draw near, he hurriedly scrutinises you. You conceive him muttering, 'He's got a bag, h'm !—knobs at the bottom—wonder if they're for pressing ? A brown paper parcel, too—that's suspicious. There's a hole in it, by gad ! Bah ! how nervous I am ; it's really a book. Hat ?—yes, that hole must be only for ventilation, and that cravat pin's too small for a lens. Buttons—one, two, three, four—they *seem* all right. I can breathe freely—stay, his cane ! No, there's nothing there. I wonder, now, if those boots——' And then he shakes hands effusively, and says how delighted he is 'to meet you, old chap !' And you remark, mendaciously, on the sultriness of the weather, whilst he mops the perspiration off his brow.

It becomes awkward to have the reputation of an expert hand camerist. For instance, you obtain unrivalled opportunities for the study of that remarkable facial contortion known as the photographer's studio smile. Personally, I do not think medical men have studied it at all adequately. Times were when it was confined to the studio, but now it abounds in the vicinity of every snap-shottist. We shall yet find it scientifically described with polysyllabic verbosity in some medical journal, and pause to admire the learning of the describer.

Then, again, one is not always on the war path. The unfortunate victim of camerophobia might occasionally omit to ascertain if his tie is of mathematically exact perpendicularity, or if his head gear is in a rigidly orthodox position when you loom large in the foreground. And the young lady in pink, with the laced parasol, may be wasting those graceful attitudes, after all. But one never can be quite sure about those horrid camera men, you know!

I do not know whether the bacillus of the disease has ever been isolated. I don't think so, but I picture it to myself as having a telescopic body, one large eye, and three legs. The eye (by the way, rather a remarkable possession for a bacillus) I imagine to be afflicted with a chronic wink; and the legs—if they have any consanguinity with the temper-trying tripod—to have a motion strictly independent, and astonishingly erratic. I am not bacteriologist enough to give it a grandiloquent appellation, but I would suggest *Draco kodakiensis*, or something longer —longer if possible. The time is arriving when inoculation with it will supply a long-felt want, and the scientist will singularly fail in his duty if he does not give the bacillus (when isolated) a name of respectable dimensions.

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A PLEA FOR A SURVEY OF LIFE AND CHARACTER.

By Hall Edwards, L.R.C.P., &c.

Much excellent and valuable work has been done by those few energetic photographic societies, who have set themselves the task of making a photographic survey of their county, or district. The Birmingham Society was the first to take any active steps in this direction. They set themselves the task of making a survey of the county of Warwickshire, and up to the present time that task has been carried out with an amount of unflagging energy, which reflects the greatest possible credit upon all concerned. They have from time to time presented to the town large collections of pictures, which have been bound and deposited in the City Reference Library.

These pictures (which are printed in carbon and platinotype only) present the exteriors and interiors of the most ancient and notable buildings in the county. Most of the churches have already been done, and many of the larger mansions have been thoroughly overhauled. Some of the architectural details have also been registered, but, all the same, much remains to be done, and many years will have slipped by before anything like completeness will have been attained. Already the collection of prints is one of the most unique and interesting in existence, and its value must continue to increase, not only with its growth, but with its age. Such collections must in time become exceedingly interesting, and coming historians and antiquarians will necessarily find the task of obtaining reliable data considerably lightened. As, however, buildings last for centuries, and as nowadays there must occur thousands of opportunities of securing good and reliable negatives of them, it will be a poor look out if in the future one cannot obtain good prints of every notable building which has existed since the discovery of photography.

In large and growing towns; old and interesting houses are constantly being pulled down to make room for modern and more convenient erections. Photographs of these would be very valuable as records, and every effort should be made to secure them, yet, curiously enough, this is just the branch of survey work which is neglected; it has nothing like the amount of interest in it which is awakened by a visit to a castle or historical building, and, as the material is always near at hand, the work is often put off until it is too late.

Many energetic amateurs are ready, and willing, to lend their aid in forwarding survey work, but they are prevented from doing so by a variety of circumstances over which they have no control. In the first place, the time at their disposal may not be sufficient to allow of their taking long journeys for the purpose of securing negatives of objects at a distance; and in the second, even granting that they have the time, there are many to whom the necessary expense would be beyond their means. To those who have the time and money, and who give both to the carrying out of this laudable work, all praise must be given. I would not say one word to discourage them; let them continue with all possible ardour, the good work they have commenced, and may the unspoken thanks of the appreciative, together with the knowledge that they are working for a good cause, be an incentive to further efforts. Work which can be done at any time is generally left undone, hence it is absolutely necessary that survey work should be carried out under the guidance of a committee, whose watchful eye should ever be on the alert to see that no 'unconsidered trifles' are passed over.

It is not my intention to make any suggestions touching upon the work which has already been undertaken. This is in good hands, and we may leave it with every confidence that it will be well done. The object of this paper is to make a few suggestions to those whom I have already mentioned as having neither the money nor leisure to help in survey work as at present carried out. There are many of the followers of our art, good workers, and at the same time energetic, who have no method in their madness. They photograph everything, from the stately cathedral to the pet pug. They have large collections of negatives of not the slightest intrinsic value, which no one would thank them for, and which, as a matter of fact, represent only so much wasted time and energy.

The ground covered by photography is so extensive that it is impossible for one to succeed if he endeavour to cover the whole of it. Having mastered the principles and gained something like proficiency in technique, it is necessary (if a success is to be assured) to set oneself a definite task, and to apply one's whole energies to its accomplishment. Survey work offers an almost inexhaustible field of inquiry. Apart from the photographing of buildings, either ancient or modern, and their architectural details, there are many and important branches of survey work which might be taken up with profit and pleasure, by those whose time is limited, and whose purses are not over full. The study of life and character in their various phases is always interesting, and, as the outward characteristics of both are always and for ever changing, the making of a pictorial record of them is an undertaking of great magnitude. Our fashions and modes of dress are for ever altering; various trades and professions are dying out, whilst others are rising; and the many surroundings which tend to make the individual, are so constantly altering in their aspects, that life (both indoors and out) is a perfect phantasmagoria. Within such a limited period as ten years — such is our progress — the outward aspects of life undergo a complete change. Drawings and photographs, made or taken ten years ago, appear to us now as absurd and ludicrous. Imagine with what pleasure and profit we should now look over an album of photographs taken 100 years ago; this is, of course, impossible for us, and will be so for our descendants unless some efforts are made in the direction of securing a systematic survey of life and character. Taking into consideration the fact that the fashions, habits, and callings (especially in our large cities), are so constantly changing, it appears to me to be more important that we should use every effort to obtain a reliable pictorial history of life and character than that we should make a photographic survey of buildings and historical relics. Such a large number of the educated public can now be numbered amongst photographers, that there are plenty of workers to carry out both these aims; and, whilst only a few have the money and leisure to take part in the survey of their county, there are thousands who can collect interesting and valuable pictures depicting the various phases of life and character in their own times and districts. Almost every town and district can boast of some characteristic custom or dress, which is indigenous to it. Many of these are slowly but surely dying out, and, if some permanent record is not made of them, they will sooner or later be completely forgotten. In some districts these changes are slower than in others, and even now it is not quite impossible to find some characteristics of the last century.

Even within the scope of my memory, and I am still young, I can recall (apart from the changes of fashion, which, like the poor, are always with us) many occupations which, owing to altered conditions, have so changed as to bear little or no resemblance to those of a few years ago. As an example, I remember that twelve or fourteen years ago (in my native city) one was unable to take a walk, at any time between sunrise and 10 a.m., without meeting a milkman dressed in a smock frock, and carrying his cans suspended from a yoke which hung upon his shoulders. Now, all is altered; I have not seen a yoke in the city for years, and I rarely see a smock frock. Our present milkmen ride upon tricycles, and carry with them cans holding an amount of milk which in the old times would have astonished our forefathers.

This is but an insignificant example, but it is sufficient to point to the necessity of not forgetting anything in our survey of life and character. In many of what are called out-of-the-way country districts, customs prevail which had their origin centuries ago. They undoubtedly bear very little resemblance to the originals; nevertheless, they are worthy of being recorded, and pictures of them must prove useful, and interesting.

In our manufacturing centres perhaps the most rapid and constant changes take place. On all hands manual labour is giving place to machinery, and old trades and methods of production are constantly disappearing. The photographing of our workshops, and of the various processes and manipulations which take place therein offers an almost inexhaustible field for labour. Street scenes, fairs, fêtes, &c., may also be dealt with.

It may be said that all these things are being photographed, and that there is no necessity for more to be done. I grant that there must be thousands of interesting and valuable negatives in existence; but, they are scattered far and wide, and without some movement in the direction of bringing them together as a permanent collection, their full usefulness will never be realised. It is absolutely necessary, if a work of this kind is to be carried out with success, that the management should be vested in some central body capable of, and willing to, formulate rules, and to make arrangements for the collecting, preserving, and storing of such prints and negatives as in their opinion are likely to prove interesting and useful. Who is to undertake the task? I am sorry to trouble them, but I cannot help but feel that it should be undertaken by the Royal Photographic Society, and its affiliated societies. The photographs should be printed in some permanent process (carbon or platinotype). They should be classified and divided into districts. They should be open to the inspection of the public, and under certain conditions should be allowed to be copied. Every print should be accompanied with short and concise notes, and, if possible, a fund should be established to provide for the purchase of such negatives as prove of great and universal interest.

All photographs sent in should be typical ones, and should represent the dress, manners, or customs at the time of taking. It may be urged that in carrying out this suggestion there would be little chance of advancing the artistic side of photography, and in this way out progress would be hampered. In ordinary survey work, I must admit that there is little chance of making artistic pictures, and one must be willing to sacrifice the artistic for the useful; but in a survey of life and character there is every scope for artistic treatment; nay, more, I know of no work which lends itself to artistic treatment with greater facility. Figure studies, as a rule (if they are successful), have a charm about them which, in my opinion, cannot be equalled by any purely landscape photograph—as an example, I would mention the works of our greatest exponent of artistic photography, Mr. H. P. Robinson. A momentary glance at his pictures will more than convince any one, that in the combination of figure and landscape, we have the greatest possibilities for artistic treatment. Whether the pictures produced for the suggested survey of life and character are to be artistic, or to sink to the level of mere records, must depend upon the worker. An artist will turn out good work, whilst an ordinary photographer will contribute only records. Both classes of work, however, may prove useful and interesting, and this is more than can be said of the ordinary work of plate-spoilers. It is hardly necessary for me to make suggestions as to how, when, and where, the work should be carried out; nevertheless, for the benefit of those who require guidance in everything, I will make a few; and as my space is limited, I must leave them to take new steps on their own account. Photograph (in natural surroundings, if possible) your baker, butcher, sweep, gardener, coachman, bootmaker, postman, newsboy, domestic, milkman, &c. This list might be continued indefinitely.

Make a photographic survey of your manufactory and the work done therein, from the bringing in of the raw material to the taking out of the finished article. Let no process, however seemingly insignificant, escape the searching eye of your camera, and you will have completed a work of which you may justly be excused for being proud.

If you are resident in the country, record the whole process of bread-making, from the tilling of the ground to the delivery of loaves. Carry your hand camera with you, and push the button at every itinerant tradesman and beggar. I might fill a book with suggestions, but have given you enough to go on with, and, if you make up your minds to apply your knowledge to some useful purpose, I feel more than convinced that you will get more pleasure out of your work, and your love of photography will deepen. Great praise is due to the few who have already made efforts in this direction—to Mr. Hughes, of Dudley, and Mr. Burrow, of Cornwall, whose beautiful photographs illustrating the various phases in the lives of our miners, are so well known to us all, our especial thanks are due. They have shown us the way to proceed, and it now only remains for us to follow in their footsteps. I trust that these crude suggestions will be the means of starting a properly organized survey of life and character.

SEASIDE PHOTOGRAPHY.

By S. E. Kelf.

The extraordinary long spell of brilliant weather—in fact, spring, summer, and autumn, all three seasons summerlike—ought to bring forth some fine specimens of seascapes and seaside pictures. Those lucky individuals who have a long 'vacation,' and the less fortunate with a short one, and even those who have to be satisfied with what is termed a 'holiday,' in these days would never think of going to a watering-place without their beloved 'Kodak,' or their three-legged brother, the 'ordinary.' Before they depart, however, they conjure up visions within visions and dreams upon dreams of beautiful pictures, which will become 'sweet memories of the past,' but which are very often short of being realised.

Failures are not even thought of, either through or beyond their own control, by means of stale plates, leaky apparatus or dark rooms, ill-timed exposures or careless development. In the matter of stale plates and paper, notwithstanding the enormously rapid increase in the practice of photography by chemists and others, there are still many who know little and care less than they should about the working qualities of these things, and only trouble themselves about the mere fact of selling them. This is from bitter experience in some small seaside resorts. Then there seems to be a sort of fascination to use the very rapid plates for everything, and therefore these people who usually do so take the fastest brand they can get to the seaside, thinking that they are necessary to secure all they wish.

Should you happen to inquire how they manage to elude light fog, they could not tell you; but, should they not elude it, they blame the 'beastly bad plates.' They also stop down their lens and use a fast shutter. This they will do on a cliff or rock that moves perhaps not once in a thousand years. Using plates such as described at places like Bournemouth or Barmouth, where the sands are loose and whitish, in the middle of the day in bright summer, if over-exposure does not result, only a 'soot-and-chalk'-like effect can be obtained. Many tourists, however, are quite satisfied as long as they get something on their plates to show for their pains. Even those who think a deal of their apparatus, and take the greatest care with it at home, will lie on it on the sands, either to rest themselves of their load or pack it up there. They obtain on development a splendid crop of pinholes. In the Channel Islands at times it is unnecessary to put the camera on the sands, for the wind will drive enough sand into your apparatus at one outing to last you the whole of your visit. But, after all, the most important element in the matter is to know what to photograph at the seaside, and get your beautiful dreams you had before starting, realised. It is not the parade, or the pier, or even the bathing machines. We are, thank goodness, getting better teaching, not only warning us what to avoid, but urging us to strive to secure something quite picturesque and original.

REVERSED NEGATIVES.

By James Reüel Smith (New York).

It frequently happens that the amateur desires a reversed photograph for some purpose, as in making tranparencies where there is reading matter on the plate, or, where some familiar scene would give an uncanny impression by having its principal features turned around as they are when a *cliché* is made from the ordinary negative.

In the arts stripping films are employed for this purpose, but the average amateur is frightened off by merely reading an account of the process, and, if he makes inquiry for some other means of attaining the desired end, he will probably be told that, by using celluloid films, prints can be made from either side of them.

This, of course, is quite true, just as was Hotspur's boast that he could call spirits from the vasty deep; but the information is rarely given with Hotspur's subsequent frankness, so that the seeker for a short cut is left to learn from experience that all delicate detail is lost in blur when prints are made from the back of even the thinnest commercial films.

The reversal may, however, be effected with no trouble whatever by merely placing the original plate in the holder with the glass side outwards.

The neat worker will, of course, first clean the glass side carefully; but, strange as it may seem, the careless body who takes no such precaution will get just as sharp pictures if his habit does not lead to putting the film side down in the developing tray, where it will stick fast as soon as the developer is poured on.

In view of the theory that halation is caused by reflection from the glass back of the plate, it will occur to the reader that he can have home-made non-halation plates by simply putting them in the holders film side to the rear, and the value of this method may be inferred from the accompanying illustration showing detail equally well in the deep woods and in the direct sun rays which were streaming into the lens.

HINTS ABOUT ROLLABLE FILMS.

By W. T. Entwisle.

How many users of Eastman's rollable films are aware of the fact that in England, where we have no exceptional dryness of climate to contend with, as is the case in America, the glycerine soaking is by no means a necessity. Indeed, my experience of more than five years leads me to believe that the unsoaked films keep better than the soaked ones, which in damp weather are apt to become clammy.

Of course, I never print my films in direct sunlight, but I have never found the unsoaked films (which I store in oblong pocket-books closed with a rubber band) at all brittle.

I was astonished to find, on writing to the Company several years ago, that they only recommend the pyro-soda developer.

I have for some time used two developers, one a 1 : 30 rodinal solution, the other a two-solution soda-quinol developer.

My negatives (hand-camera exposures) are, after soaking in water, immersed in the former; if the detail begins to flash up all over the film, I rinse it and place it in a large dish of the hydroquinone, in which I find that they develop quite evenly without rocking.

If the film develops in the rodinal gradually, with the high lights in advance of the detail, I finish development in that solution.

I generally find that snap-shot prints can be trimmed down with great advantage to the composition, and am therefore greatly opposed to the prevalent system of trimming prints to one fixed size.

From my films I take a rough print, which I trim down gradually to the most suitable size, and then *trim the negative* to the same size. I then print them on paper slightly larger than the negative, and, after finishing, I trim this dark border to a narrow band, which adds greatly to the finished appearance of the print, giving it the appearance, when mounted, of being in a cut-out mount. The most suitable width for this border varies with different subjects, but in no case should it be more than one-sixteenth of an inch.

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GELATINE EMULSION FOR LANDSCAPE WORK.

By George T. Harris.

In pre-gelatine days it was, I believe, the practice of the best workers, when preparing their plates, to keep in view the character of the subject upon which those plates would be used, and to attempt some adjustment between the plate and subject. In these later days of gelatine plates, however, one formula is made to meet the requirements of an infinite variety of subjects. A dozen plates from the same batch of emulsion will be exposed on as many different classes of work; here a landscape, there a portrait, the copying of a faded silver print one day, an oil painting, possibly black-and-white work, the next, and, *mirabile dictu!* one undeviatingly compounded developer for the lot. Verily, no mean skill is required to prepare a plate that shall meet the exigencies of latter-day photography, and critical consideration brings the conviction that the average suitability struck by modern plate-makers is one admirable in every way, and that they are to be congratulated in issuing plates which stand so well the severe test the average user imposes upon them.

But is the universal plate the highest development of dry-plate photography? The most convenient, without doubt, it is, for perhaps it is overmuch to expect plate-makers to make and dealers to stock three or four varieties of plate; but a division as practical as it is desirable might be made between portrait and landscape plates, for the essential of the one is seldom, if ever, the essential of the other. In landscape work a plate having a fairly 'steep' gradation gives results distinctly superior to those obtainable from a plate that would be deemed the most suitable for portraiture; but, as, at a rough estimate, nine-tenths of the plates made are used in portraiture, so this branch of photography has the premier consideration from the manufacturers.

Further, the element of rapidity is one that should be intelligently considered when determining on a plate for landscape work, and I have no hesitation in saying that for this class of work plates of excessive rapidity are not only of no advantage, but are a distinct disadvantage, the loss of 'roundness' in the image being most noticeable when compared with an image on a plate of medium rapidity. The amount of shutter exposures, necessitating the use of rapid plates, made at the present time, and on subjects whose appearance should rescue them from such an indignity, is truly appalling, and one fears that the time is approaching when a lens cap will be found only in some museum of photography labelled 'An Ancient Device for Exposing Photographic Plates.' A mechanical shutter and rapid plates are valuable and indispensable adjuncts to the outfit of a landscape photographer, but the indiscriminate use of either cannot be too strongly deprecated.

Then, again, we come to the question of colour-sensitive plates. Years pass by, and the army of orthochromatic workers increases slowly. Gradually the photographer is beginning to realise that a plate specially sensitised for green and yellow must be of more value in landscape work than one whose chief sensitiveness lies in the blue and violet; and, once this fundamental truth infiltrates itself into the photographic mind, colour-sensitive plates will be valued at their true worth. Orthochromatic plates and yellow screens are such marvellous additions to the efficiency of the landscape photographer's equipment that the apathy of photographers in realising their importance almost parallels the slow acceptance of such truths as gravitation and evolution, and in a few years we shall wonder that our eyes could ever have remained closed to the superiority of plates specially colour-sensitised.

The formula now given for an orthochromatic gelatine emulsion has had a two years' test upon every variety of landscape subject; the yellow sensitiveness is good, the exposure with an ammonium-picrate screen, such as I described in the JOURNAL ALMANAC for 1893, being about double that without the screen. Compared with the commercial plate of to-day, the general sensitiveness of these will be thought low, the exposure with U.S. 64 stop upon an open landscape averaging in June midday one second. The plates are so generously coated that, after development is complete, no trace of the image is seen on the back of the plate, and clouds, when existing with sufficient contrast in the view, are well rendered in the negative even without the screen. With the bulk of emulsion resulting from the formula given below, about fifteen dozen whole-plates should be coated.

Perhaps in no operation in photography does the equation of personality enter more largely than it does into the development of the plate, hence little upon this subject can be said here with advantage. Personally, a pyrogallol and ammonia developer, *blasé* though it may be considered, gives results in every way satisfactory, and, while not insensible to the merits of modern developers, the conviction with the writer remains that, for the class of work this paper deals with, the developer that shall show greater efficiency than pyro and ammonia is, so far, peaceably at rest in the great lap of futurity.

The solutions for the emulsion are:—

A.

Potassium bromide	86	grammes.
Barium iodide	3·5	,,
Gelatine	16	,,
Water (distilled)	680	c. c.
1 : 3 solution H. Cl.	2	,,

B.

Silver nitrate	104 grammes.
Water (distilled)	680 c. c.

C.

Gelatine (Drescher's)	130 grammes.

To the bromised gelatine (A solution) is added, immediately before emulsification, 11 c. c. of a one per cent. solution of purified erythrosyne. The solutions are emulsified by adding B to A at a temperature of 60° C. Boil forty-five to sixty minutes. The washing should be very thorough, as the keeping qualities of orthochromatic plates are, I am convinced, dependant, in a great measure, on the entire elimination of the superfluous colouring matter. The emulsion is allowed to ripen, and may, with advantage, be several times remelted during this period. It is then filtered and final additions made, these, in my own case, being:—

1.

Chrome alum	1 gramme.
Distilled water	50 c. c.

2.

Phenol	1 gramme.
Alcohol (abs.)	50 c. c.

It is unfortunate for the popularity of orthochromatic photography that the amount and quality of light permissible in development has been so stated as to deter most photographers from becoming users of orthochromatic plates. With the above plates (as with commercial orthochromatic plates, unless specially sensitised for the red), I use such a pleasant amount of *safe* red light as illumines a large dark room sufficiently to enable one to make journeys to its uttermost confines without creating an instant demand for that language which is considered inimical to our greatest comfort later on.

A PRINTING-ROOM BENCH.

By J. A. C. Murray.

In double printing, masking, vignetting, &c., a lot of trouble is usually experienced in adjusting the print when the frame is held up in the ordinary manner, especially when large sizes are used. All this trouble may be reduced to a minimum if the bench in the printing room is provided with a glass top, so arranged that the light passes up through it from a reflector.

It should be a piece of heavy plate glass, larger than the largest printing frame used, and it should be set in a strong wooden frame, to form the bench top.

It is as well to have the ends of the frame made perfectly square, as it can then be used for trimming large prints with the T-square.

Owing to the light passing up through the bench, it will render double printing an easy matter, as there is little difficulty in adjusting the print when on the flat, both hands being free, as compared with the frame when held up to the light; also, in medallion and other masking work, vignetting, &c., the work will be rendered more easy on account of being done on the level.

There is nothing new or original in all this, being known to most old workers; but, not having seen any mention of it for some years past, I thought it would bear repetition for the benefit of newer workers.

I must here tender my thanks to you, Mr. Editor, for introducing to my notice the metol-hydroquinone developer mentioned in The British Journal of Photography (page 531, 1894). It is, in my hands, about the best and most convenient I have ever used, the quality and general excellence of the negatives are so good.

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A TRIP TO ZERMATT AND BACK.

By Major C. Gardner Vatcher.

Our trip abroad this year was to Zermatt, taking a few side trips *en route*. Starting from London, we travelled *viâ* Newhaven and Dieppe. By the bye, can any one tell me why the London, Brighton, and South Coast Railway insist on the registration of baggage, making a charge of 6*d*. per package to Dieppe, and 1*s*. to Paris? I ask this because, provided your baggage is the weight allowed, *the Ouest of France charge only* 1*d*. *to Paris* —*i.e.*, Dieppe to Paris. We stopped a day or two at Rouen, which is full of bits for the camera. Here, as no doubt your readers are aware, is the prison whence Jeanne D'Arc was taken to be burnt, after being condemned by a Rouennais Court of Justice. Here are different churches containing tombs, or memorials, of different personages closely interwoven with our own history. The quays, open markets, and quaint streets furnish any amount of snap-shots. We did not stop in Paris on our way out, but travelled through to Dijon. Here there is a fine old church, and a palace that used to belong to the Dukes of Burgundy, with several other things worth taking. Our next move was to Montreux, whence we took trips to Glion, and again to the Castle of Chillon. During my stay I took several photographs of lake scenery and shipping, &c. We next went to Evolena, a village six hours' drive from Sion and up in the mountains. We arrived at Sion at six o'clock at night, and a man volunteered to drive us up there and then. It was a very dangerous thing to do, as the road was no wider than the carriage, and skirted a precipice or steep side of a gorge down which roared a torrent. We had previously no idea of the time it would take to get up there, but soon after passing a village or two daylight ceased, and it became pitch dark, and we arrived outside our hotel just about midnight. The next morning we had a lovely view from our windows. The village, a large cluster of old châlets occupied part of the foreground; green pasturages, in which peasant women in their quaint costumes worked, stretched up the valley, which was backed up by the Dent Blanche and other snow mountains, the frame to the picture being the dark pine trees on the sides of the mountains stretching up to the sky. The river roared down the right-hand side of the valley, and was crossed here and there with rough wooden bridges. It is still very primitive and very picturesque, but the smells are most unholy. Some châlets are very pretty with stairs and galleries outside to the top stories. Others are built on stone pillars capped with round flat stones, after the manner of corn staddles, and are used to store grain in. Here we saw, the first time this trip, herds of cows and goats with the peculiar-shaped steel bell round their necks. Whilst up there, I walked to the Ferpècle glacier, much higher than Evolena, and situated at the foot of the Dent Blanche, some eight hours' walk there and back. I also went to the Arolla glacier, in another direction, and about a ten hours' walk there and back. Both walks are well worth taking for camera work. Coming down from Evolena, we saw how dangerous the road was, and what lovely scenery we had missed. Amongst other curious things, about half way down are some glacier-formed pinnacles of earth and stone surmounted, mushroom fashion, by a large block of stone. We strolled about Sion a little, taking the old Bishop's palace perched upon a hill, and then went on to Zermatt. The railway journey from Viège is very fine. Whilst at Zermatt we did a few of the usual walks, not mountaineering, as it always seems to me the game is not worth the candle, and the valuable lives of the poor guides are always risked for the pleasure of being able to say, *à la* Yankee, I've done this or that. Our trip to the Gornergrat is worth recording, as we had samples of weather of each season of the year. When we started it was like early summer, when we got up to Riffel Alp it commenced to drizzle and rain, and as we went higher it sleeted, hailed, snowed, thundered, and lightened, and was bitterly cold, It seemed at first likely that we were to have no view, but, after waiting an hour and a half, the sun shone and the clouds dispersed, and we had the grand panorama opened up before us—Monte Rosa, Weisshorn, Breithorn, Matterhorn, &c., in all their dazzling brightness. By the bye, one evening I sat next to an Englishman who had just come down from the Matterhorn, and spoke of his feat as if he had just taken a five-mile walk. This mountain, as no doubt most of your readers are aware, is very dangerous, and until 1865 was thought unclimbable. Then Mr. Whymper, of Alpine and Andes fame, with six others, viz., three guides and four gentlemen, made the ascent safely, but, coming down, the rope broke and four perished. They found the bodies of three, but Lord Francis Douglas, one of the party, was never found. There is a heap of view work at Zermatt for the camera and shottist, and *inter alia* an especially fine herd of goats started usually at about 7 a.m., every morning in August for the mountains. We left here and went over the Tête Noire to Chamonix from Martigny, but I recommend the road we came back, viz., *viâ* Fin Haut and Salvan to Vernayaz, it is much finer to Châtelard, and from there to Chamonix is the same road. Of course there Mont Blanc is the great attraction, We, however, went one day to the Glacier des Bossons, with its magnificent crevasses, and another day to the Mer de Glace, both long, hot, up-hill walks. At Vernayaz there is a good waterfall, also the famous Gorges du Trient, a different style of thing from those at Zermatt. After this we went to Villar, a very pretty mountain health resort three hours up from Aigle. Our next stopping place was Lausanne, for Ouchy (Lausanne by the Lake). And the last place we visited was Ballaigues, near Vallorbes, the Swiss frontier town, little visited, I think, by the English, but very pretty, with heaps to do there. This trip lasted over two months, but could, of course, be done in a much shorter time. I can thoroughly recommend it to all who want really pretty pictures.

OUTDOOR PORTRAITURE.

By James A. Gee.

As there are, doubtless, many amateurs whose great desire is to take really presentable photographs of their friends and neighbours, and who have no studio wherein to work, I thought a few hints might be acceptable to some as to obtaining the best effects in their back gardens.

First place your sitters facing the north, out of direct sunshine, for a north light is found in practice to be the best. Now, if there is too much top light, there will be very heavy shadows under the eyes and eyebrows, and the hair will not be rendered correctly. To obviate this in a great measure, use a large umbrella, to be held by a friend at such an angle as will shade one side of the face and the top of the head. By carefully noting the effect as the umbrella is moved backward and forward, upward and downward, you will find there will be one position which will give good modelling of the features, and produce a very fair result indeed.

As to backgrounds, some may have no such commodity, and have to make shift, or even make use of a brick wall, which is much to be condemned. To such I would say, Use an unfolded yellow-tinged blanket, held at the back of the sitter, and moved up and down during exposure, which will prove a satisfactory arrangement. The movement during exposure produces a good, even tone, and prevents the grain of the blanket being reproduced.

'EXPERIENTIA DOCET.'

By F. J. Mortimer.

The familiar, 'Do unto others as you would be done by yourself,' is what has prompted me to pen the following:—I have derived considerable benefit myself on so many occasions from perusing accounts of the experiences of others photographically inclined that certain little wrinkles, with which I have become acquainted, may possibly, through the medium of The British Journal Photographic Almanac, confer a similar benefit on others. For instance, I have frequently heard brother amateurs complain of having spoilt a negative, probably a unique one of their rich aunt's defunct tabby, impossible to reproduce and on which so much depended, by accidentally digging their finger-nail through the wet film, mistaking it for the glass side, or else by dumping it down somewhere film downwards. Remedy: Always, when taking a negative from the washing water, gently tap the corner of it with the teeth. It is impossible to mistake one side for the other then, as the glass side gives forth such a clear click—and it doesn't hurt the teeth.

Again, one hears of that perennial nuisance—air bubbles in the developer, causing unsightly marks in the negative. Remedy: Pour plenty of developer on to the plate from one corner of the dish with a sweeping motion (not sufficiently sweeping, however, to shoot half of it up your sleeve), quickly pour it off again into the measure glass, and as quickly pour on to the plate again from the *opposite* corner of the dish.

This not only effectually gives notice to quit to any air bells lurking about, but also thoroughly mixes the developer.

I have also heard dissatisfaction expressed after a film has been stripped and enlarged with cresco fylma, or by any other similar means, the enlargement not being so sharp as expected or else bringing to light too many freckles, or something equally unforeseen. Remedy: Put the film into methylated spirits, and it will slip back into its original size much quicker than it became enlarged.

It is also a good plan to apply methylated spirits after washing to a negative that has frilled during development or washing, the spirit not only banishing the frill and hardening the film, but the negative may be dried at once in front of a fire.

Then, again, take a negative slightly over-exposed, with a dull grey expanse of sky. How a few clouds would improve the picture! 'But I haven't got a suitable cloud negative,' you say. Remedy: Go into the scullery and annex the black-lead pot, and get a little of the lead on the top of your finger (you will generally get a lot more on various other parts as well if not careful), and, by daubing the sky part of the negative gently with a smeary motion, 'cumulus' and 'cirrus' appear forthwith.

Of course, a little artistic common sense must be exercised in putting in these clouds, for nothing looks worse than bold-looking stormy clouds lit from the right in a picture, which represents a mild-looking evening scene with a lake in the middle distance, without a ripple on its surface, and lit from the left.

Another complaint frequently heard is, 'I can't get a decent vignette no matter what I try.' Remedy: Get some stout brown paper, the smoother the better, and perfectly opaque, although a few pinholes won't matter, and cut into pieces a little larger all round than the printing frames you use. To vignette cut in the brown paper with a pair of scissors an opening slightly smaller than the figure or bust you want to vignette, but following the outline closely. Then paste a piece of tissue paper over the opening, and fix the mask to the front of the printing frame with a couple of drawing pins, having first arranged it so that the opening comes directly over the part you intend vignetting. Put in your printing paper and print in diffused light (*never* print in direct sunlight), and you'll get the softest vignette conceivable, and, brown paper being so cheap, you can make and keep a separate mask for every vignettable negative, each having its own particular shaped opening.

And, lastly, who has not attempted to mount glazed P.O.P. prints and failed, in spite of the innumerable patent glaze preserving mountants in the market? Let me tell you how to do it, and keep the glacé surface intact. I fancy I heard some oné say 'Rats,' so I will say instead, 'Let me tell you how I do it.' First procure a piece of stiff tin about three inches wide, and longer than the largest print you are likely to mount, and with perfectly straight edges. A tinman will cut you such a piece for about a penny. Procure likewise a small stiff hog's-hair brush, like artists use, and a bottle of fish glue of the Le Page's variety. To mount the print, ascertain first by means of pencil dots the exact place the print will occupy on the mount, and then, having stripped the print from the ferrotype plate or whatever it has been squeegeed to, put it face downwards on a piece of dry clean blotting-paper, take the piece of tin, and holding it in a sloping position on the back of the print within one-eighth of an inch or less of one edge, and so that a margin of about one-eighth of an inch is left showing, apply the fish glue (which should be fluid) with the hog's-hair brush to this exposed margin, and repeat the process with the other three edges. Then turn the print over carefully by one corner, and put it in its exact place on the mount, carefully pass a finger covered with a soft rag round the edges, and the print is mounted. Not much practice is necessary to mount glazed prints thus, and the result is all that can be desired.

HAND-CAMERA NOTES.

By Henry V. Lawes.

I don't know whether the following may be of use to those who go in for snap-shots, but I have been using a hand camera some time, and found, from experience and from what I have seen generally amongst beginners in this branch of photography, that the majority of negatives have been *badly developed*, and also seem *much out of focus*. When I bought my camera I found the markings for distance not correct, and tried to alter and get them quite right, but somehow could not manage it. I shortly afterwards met a friend, and he showed me some of his snap-shots, which quite astonished me; they seemed quite sharp from the foreground to the distance. Naturally I inquired how he had got such good results, and he said he had found what he called the 'equivalent' focus of his lens, *i.e.*, he focussed on the ground glass a landscape, and used a magnifying glass until he got the foreground, say, about thirty feet away and the distance all in focus and quite sharp. He then made a mark on his distance board, so that, when using it, he could always have it to the focus. I tried his dodge, and could hardly believe the great difference between my former pictures and those I have taken since altering, and now I invariably work at this focus for street scenes, shipping, and general use. Of course sometimes you may require to photograph something much nearer; then naturally your focus will require altering. This should have been found out, and marked from, say, six feet up to twenty feet. I find with my lens—a Wray, five and a half inches—that *f*·11 is quite small enough. I prefer to give *good exposures*, and develop carefully.

Regarding development, I have used several brands of plates, and find that somehow they appear quite 'granular' after development. At last I have fixed upon the Paget XXXXX, and use the following pyro-soda developer.

A.

Pyro	60 grains.
Metabisulphite of potassium	15 ,,
Water	10 ounces.

B.

Washing soda	600 grains.
Sulphite of soda	800 ,,
Water	10 ounces.

To develop, use three parts of A to one of B, and add a few drops of a ten per cent. solution of potassium bromide. Should the plate show no signs of coming out in about three minutes, then add a little more of B, and so on.

Of course, if the plate is much under-exposed, less of A must be used, and more of B. If careful with the development, and you don't hurry at all, your negative, when finished, should show *no more grain* than an *ordinary plate*.

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IDENTIFICATION BY PHOTOGRAPHY.—AN ABNEGATION.

'Put out the light, and then—Put out the light!'—OTHELLO.

In presuming to deal with contentious business in these pages, the writer will at once admit that he is to some extent open to a charge of inaptitude. Events, moreover, have conspicuously handicapped him. Hence he owes it solely to the genial forbearance of the Editor that he is permitted to resume his pen upon a topic which has been now so greatly discredited.

After having from time to time, and with some amount of vehemence, alleged that the geometric method of dealing with identification was an infallible one—and especially so in a particular instance, he has been suddenly confronted with the 'confession' of his chief exemplar, to the effect that after all—to borrow the words of Captain Fluellen in the play —'He is not the man that he would have gladly made show to the world' that he should have been.

Surely, all further contention is at an end, and identification by photographic portraiture has received its *quietus*. How very forcibly this opinion must strike 'the man in the street' may be here fully and frankly admitted.

Yet, if this personal *ipse dixit* and abnegation are to be received and recorded as the final and accepted conclusion, what, meanwhile, becomes of those side-light and demonstrable facts which had served to add 'confirmation strong as holy writ' to the identification? Assuredly it is no myth that upon the portraits of the earlier epoch—the younger face, not less than upon those of the later epoch—the older face, there exist the vestiges of a punctured tracery, of a nature as unique for its artistic merits as for its unwonted position. And these, be it remembered, are found upon photographs the which are absolutely at one in their relative admeasurements, and are as correspondent in their details as the divided halves of a banker's note.

Moreover, these vestiges are not the only physiological peculiarities of an exceptional nature which undoubtedly exist in the man (or men) of the two epochs. Those peculiarities, however, be their cogency what it may, stand obviously apart from the photographic issues.

But, further, in the department of photography, there comes to the front what is known as the 'damaged thumb'—touching which a significant episode transpired, upon an allegation that the original Daguerreotype, subsequently to having been placed in evidence, had been grossly tampered with.

Surely, if it be true, as Galton declares, that men may be individually indentified by the mere enlargements of the imprints of their finger tips, then how obviously more reliable should be an enlarged photograph of the cicatrix of a mangled thumb! And, then, have we not recently been assured that, by superposing a sufficient number of pellicular negatives, details the most indistinct will again become plainly visible? Why should tests such as these be always and persistently ignored?

Finger tips! Why, in the Chili Daguerreotype nearly the whole of the left hand, inclusive of the damaged thumb, is visible. Yet these scientists, who so confidently proclaim the infallibility of finger tips, have ever carefully refrained from applying their professedly infallible tests to the solution of this, one of the most noted cases of disputed identity that ever transpired in history!

But the curtain has at length descended, and the chief actor disappears into obscurity. Still, from the standpoint of the writer, the pity of it is —and he can of his own knowledge avouch the fact—that, in the final act of this remarkable drama, destitution and fast-approaching decrepitude have resulted in making that *dênouement* acceptable and accepted which had been so long and so stoutly battled with. The end is a humiliating self-abnegation effected upon a pecuniary basis.

'The rest is Silence.'—HAMLET.

TO THE BEGINNER IMPATIENT.

By JOHN DORMER.

A FEW contradictions, my dear friend. If you throw up the whole business when your first dozen plates go wrong, it is wrong of you to describe photography as efflorescent putrescence.

When you have got one mediocre—I should say fine—negative, it *is* hasty of you to condemn judges to whom you submit it because they do not instantly proclaim you a new and surpassing genius.

Hand cameras are always the easiest of things for a novice to work, but I should advise you to call the makers squiffy asinine jolterheads in private *only* when yours refuses to act properly.

If you consign your plate to considerably hotter climes for some defect in development, do not overlook the fact that heat frequently results in blisters.

When you have tried half a dozen developers on half a dozen plates without success, there is no reason to be despondent. You must mix them together and pour over the seventh plate. The result will, I think, prove a surprise.

It *is* rather absurd of photographers to be so particular about the hypo, but it is rather unwise to dip your fingers in developer and fixing bath alternately.

Your friends will, of course, like you to take them as often as possible, but you must not let them shelve the portraits you produce. They may be prejudiced in favour of a professional photographer, but do not be so weakly good-natured as to allow *your* portraits to be placed in an inconspicuous position in their sitting-rooms.

Some people will advise you to commence work on simple subjects, but this is mere jealousy. The proper subjects for beginners are important buildings in crowded thoroughfares. Take them.

It would be ridiculous of you to confine yourself to any one department of the art. Do not be bashful, but volunteer, as soon as you get the requisite chemicals, for carbon transfer, dark interiors, or lantern slides of bacilli.

Finally, people will despise you if you glance over any photographic journal regularly. Ignore such papers altogether, unless you have any obscure difficulty, such as a curious frilling round the edge of the plates, or ghostly negatives. It is advisable then to badger the editors thoroughly, because elementary treatises on photography make a point of omitting information germane to the subject.

A SIMPLE PRESSURE SPRING FOR THE DARK SLIDE.

By F. H. Glew.

A piece of black rubber tubing (feeding-bottle tubing) placed between the two plates in a dark slide presses them firmly, prevents shaking better than the usual steel spring, and reflects less light.

DUPLICATE BLUE PRINTING.

By E. D. Bartlett.

Every effort is made nowadays to devise some means of saving time. It is on this account that we are taught more and more to use our thinking faculties to attain this end. Sun printing from tracings by means of sensitised paper is becoming more generally used in drawing and tracing offices. The other day it was necessary to obtain two copies from a tracing, and I had only one tracing in my possession to print from, and, if used in the printing frame, it could not be both printed from and traced at the same time. The time at my disposal did not allow of one being done when the other was finished, so I hit upon a plan which proved successful. As some of the readers may be placed in the same predicament one day themselves, the following is for their benefit:—

To obtain the two copies at one time, a sheet of tracing paper was coated with the sensitising solution and also at the same time another piece of paper such as is generally used for the purpose. The two were then placed in the printing frame placing the sensitised tracing paper next to the tracing to be copied, and behind that the sensitised paper. Printing in direct sunlight, it will be found that, besides having a good dark print upon the sensitised tracing paper, we have another lighter print upon the sensitised paper. Owing to the light being spread in passing through the two thicknesses of transparent paper, the lines upon the second copy will not be quite so sharp as those upon the first, but will serve as a fair copy for ordinary purposes. Any of the usual formulæ can be used, but I may mention that the formula used upon the occasion was:—

Ammonia citrate of iron	20 parts.
Water	100 ,,
Red prussiate of potash	15 parts.
Water	100 ,,

The two solutions are kept separate, and mixed when wanted for use, taking equal parts of each.

ASTRONOMICAL PHOTOGRAPHY.

By Procella.

To keep the camera in precisely the same position, either when fixed upon an equatorial telescope or when simply moved by hand by means of right ascension and declination screws, it is absolutely necessary to have the position of the guiding star in the eyepiece of the guiding telescope always kept on one spot. This is usually done by means of cross wires in the eyepiece, the star being kept behind them, and thus out of view, or in a small aperture at the crossing of four wires. A better plan is to have three cross wires, the ends of which are fixed at equal distances on the diaphragm. When this is done, and a fine needle pushed through the crossing, a minute aperture is opened which allows the star always to be on view. Arranging the wires in this way requires some trouble. A friend of mine, who is a F.R.A.S. and an enthusiast with the telescope, has recently taken some very sharp negatives on glass by simply moving the guiding telescope by hand, with exposures varying from a few minutes to an hour and more.

He has a quarter-plate camera fixed on the tube of his Dollond, and has devised one of the most simple and effective devices for seeing the guiding star, which so far as I am aware, has not been used by any one else. He simply takes a triangular file and makes a nick in the edge of the diaphragm in the eyepiece. He keeps the star in this nick when exposing and has it always in sight. Of course, with a shallow eyepiece it is a matter of very little consequence whether the star is in the centre of the field or not. The important thing is to have it and keep it in one position, and it is self-evident that it is much easier to do this when the star is always seen than when it is hid behind cross wires. The device is so simple that it can be used by any one without trouble.

PRINTING IN CLOUDS.

By C. H. Crosby (Chicago).

It may seem strange to the readers of this world-renowned Almanac that an amateur photographer of the United States should undertake to say any thing on so well-worn a topic as cloud-printing, meaning by that phrase the addition of clouds to prints which are defective by reason of the original negative either having no clouds upon it, or else being so dense that the clouds will not print. My only excuse is that the method I am about to describe is easy and simple to use, and, although I have read many thousands of pages of photographic literature, I have never seen it described in print. I have no doubt, however, that the method is well known to many photographers, but they probably think that every one else knows it and therefore is not worth speaking about. With these preliminary apologies, let me proceed.

Most directions for printing in clouds direct that a mask shall be made to fit the landscape of the negative, and that this mask shall be carefully fitted above the landscape so as to shield the sky of the negative while the landscape is being printed, and also that a mask shall be fitted to the part of the print below the sky of the negative so as to shield the landscape while the clouds are being printed. Any one who has ever tried it knows that the preparation and use of these masks is almost an impossibility. They are difficult to make, and, as a rule, a line of white will show between the clouds and the landscape.

I will not allude to other methods for printing in clouds, which have been described in photographic journals from time to time, but simply say that the method I would bring to your attention dispenses entirely with all paper masks or methods of the sort

Having a negative from which it is desired to procure a print with suitable clouds, the method of procedure is to place the negative in a frame with the sensitive paper in the usual manner. The operator should provide himself with a piece of soft opaque cloth, the colour and material not being of any consequence so long as the cloth is not stiff nor too thick. Holding the printing frame in one hand, exposed to the light, in the other hand the soft cloth should be crumpled up so as to give the rough outline of the landscape and cover the entire sky part of the frame, and while the landscape part is printing this cloth should be kept in constant motion up and down the frame, so as to expose the top of the landscape at intervals, and by this means prevent a harsh graduation between the landscape and the clouds. Having printed the landscape to the required depth, the negative and the paper are to be taken from the frame. The cloud negative is then to be placed in the frame, and the paper placed upon it in the desired position; then the first process is repeated, except that it is reversed. Holding the negative as before to the light, the cloth mask is to be adjusted in a rough way to the landscape, and the landscape is to be kept covered while the cloth is in motion, the same as the sky was covered in the first operation.

I have known the most successful prints to be made by this method by gentlemen who had failed of success with any of the other methods. It may also be noted that this method avoids painting out with opaque or other substances, and it may also be noticed that, after the landscape is printed strongly, the clouds may be printed close down, and in fact, over the top part of the landscape without showing in the least, enabling one to give a very soft graduation from the horizon up.

Having a landscape with prominent objects, such as a large tree, a tower or church steeple, projecting above the average line, these objects may be permitted to remain exposed to the light while the clouds are printing in, without any perceptible damage to their appearance or to the appearance of the clouds. In fact, there are times when the original negative and the cloud negative may be put into the frame together and printed at the same time, as, for example, a print which I enclose of the Egyptian Obelisk, in Central Park, New York City. The original negative of the obelisk is entirely without clouds, but, in printing this view, the negative of the obelisk and the cloud negative were placed together in a printing frame with the sensitised paper, and the obelisk and clouds printed at one and the same time.

There are various little modifications of this process that will reveal themselves as it is used, and I trust the information may be of some little service.

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HOW TO REMOVE GLOSSY PRINTS.

By F. H. Glew.

There is often a difficulty in getting the knife under the edge of the print to commence lifting, and the knife is certain to scratch a pulp board or ferrotype plate. To obviate this difficulty, squeegee the prints down in the ordinary way; then, whilst wet, just turn one corner back—about one-sixteenth of an inch is ample; the print dries with this corner raised sufficiently to be gripped between thumb and finger, and I have never lost a print since adopting this plan.

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THE PHOTOGRAPHIC CONVENTION OF THE UNITED KINGDOM.

By R. P. Drage.

Twelve months ago the writer sent an article for the then forthcoming Almanac, which was, unfortunately, too late for publication. In that article the fact was noticed that in nearly all parts of the world the writer had come across copies of The British Journal Photographic Almanac, finding it specially popular in America.

This opportunity is therefore taken of inviting our American cousins who are photographers (and so many hundreds of whom visit our shores every year) to time their visits so that they can join in our annual Photographic Convention in July, 1896.

They can be assured of a most hearty welcome, as well as a thoroughly enjoyable time, and it has before been pointed out that facilities are afforded for photographers attending the Conventions for access to objects and places of interest, which at other times are almost unattainable.

The meeting in 1896 will be at Leeds, where we have been promised a most cordial reception, and the various excursions which will be arranged in the surrounding districts will go to make up a most tempting programme. The world-known veteran, Mr. H. P. Robinson, will be President for the year.

Year by year, at these Convention meetings, the men who, by their artistic efforts and researches, have made photography what it is to-day, gather together from all parts of the three kingdoms, and discuss matters of vital interest to photographers throughout the world.

Our membership is fairly divided between professionals and amateurs; no distinction is made. All are good fellows, and thoroughly enjoy the happy yearly meetings.

We ought surely to expect, then, that more of our American friends will join us for that week in July, 1896, knowing, as we do, the great enthusiasm with which the scenes and associations of our glorious old country are regarded by all true Americans.

DEFAULTING MEMBERS.

By H. M. Whitefield.

There are many articles published in the photographic papers relating to processes, dry plates, lenses, &c., employed by members of the numerous societies, but few, if any, relating to the members themselves, although the variety is great, and in a few instances their unpleasant diversities obscure that unity of photographic aim and interest that binds societies together.

There are two kinds of jealous men: the member who has ability and produces good work, and in many respects is socially agreeable, but who cannot tolerate a word of commendation to another member lest his own glory should be in danger of an eclipse. The other jealous man is he who can only show mediocre results, which, however, satisfy him, and who fails to see merit or taste in the achievements of others, hence takes offence at the praise bestowed on their efforts.

Then there is the smart member, who well knows the rule of his society as to subscriptions being payable in advance, but who holds back his share towards the general expenses until the end of the financial year, oblivious of the fact that the current outgoings have to be paid by some one, and that photographic societies are not usually profit-making ventures. This type of individual never has 'Hon. Treasurer' appended to his name.

Brother to the smart man is the careless man; he means well, but somehow habitually forgets for several months to provide himself with his subscription before coming to the monthly meeting, and, in response to the Hon. Treasurer's appeals, replies that he 'will attend to it next month,' but he does not.

Another specimen is the mean man, who allows himself to be enrolled a member of a society and to enjoy its benefits, but who omits to pay his subscription altogether; when he is pressed for a settlement of arrears he thinks the case is adequately met by his resignation, such a man should be made to be honourable in his deed, although it is hopeless to expect him to become honourable in intent.

The worst of all is the impudent mean man, who is occasionally met with, one of those parasites of social life, who, despite all precautions, contrive to creep into the society of gentlemen. He does not pay, he does not intend to pay his quota to the common weal, and when he has exhausted the Hon. Treasurer's long-suffering patience, he coolly snaps his fingers at him and says, 'You cant't compel me to pay the subscription, your Society is not incorporated, and I won't pay; ' so with a chuckle he hugs his delusion to his bosom.

We are not concerned to undeceive that creature by these remarks, but we desire to clearly point out to councils, secretaries, and treasurers of photographic societies, how they can easily and legally compel him and other defaulting members to pay their subscriptions.

There is a little-known Act of Parliament which settles the matter most distinctly—we say little known, for we have reason to believe that not a few solicitors and possibly some County Court judges are not aware of its existence. We refer to the *Literary and Scientific Institutions Act*, 1854, which may be obtained for sixpence from Messrs. Eyre & Spottiswoode, the Queen's Printers, Harding Street, Fetter Lane, London, E.C.

The greater part of this Act concerns the acquirement of land and real property by the literary and scientific institutions in this country, and has overshadowed the few potent clauses, No. XX. to the end of the Act, which are most effectual safeguards to all well-conducted societies of this description. Although the Act was promulgated in 1854, when we believe only two of the present day photographic societies existed, yet it is framed as if it were intended to exactly satisfy the requirements of the large number now scheduled in THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC.

The managing body of every photographic society should possess a copy attached to its roll of members.

We have only referred to some of the minority unhappily found in societies from time to time, but fortunately there is a large majority of quite a different stamp, we need not describe them, for *good wine needs no bush.*

A FEW HINTS.

By LESLIE NAISH.

A WRINGING machine (common clothes-wringer) roller makes a first-class squeegee, either cut in two or used the entire length. Any smith will make a Y-shaped handle for a few coppers; then get a twopenny file handle, and drive on. You will then have a squeegee that will last and wear out a hundred shop-bought ones.

Cheap dishes can be easily made by any one who can use a soldering bolt. Cut your pattern from an old mount, or any piece of cardboard; then procure a few sheets of tin. After soldering up the corners, get them japanned by a practical man. Whole-plate dishes cost about 5*d.* each by following this plan.

Why amateurs, or, in fact, any one, *buy* vignetting, glasses, zincs, papers, &c., puzzles me, when they are so easily made from a spoiled mount. Any shape can be cut and fixed to the printing frame in two or three minutes, the cost being practically nothing.

'WASTE NOT WANT NOT.'

By Walter A. Locks.

The memory of the assistance which I, as a beginner in photography, derived from the kindly tips published in the Annual, has induced me to offer a few hints, which may be instrumental in helping some perplexed amateurs over the thorny path of 'the elementary stage.'

The more I know of our interesting art the more convinced I am that there are few, if any, operations in the whole process of preparing the photographic picture wherein there need be any waste. One is continually stumbling across new uses to which articles, hitherto regarded as useless, may be put, and then one falls to wondering how it is these tips never find a place in the photographic text-books.

Take the spoilt negative, for instance. Here is an article which, in the dark rooms of most beginners, speedily accumulates to such an extent that the idea is conceived of building a conservatory. Practically, the only use to which these spoilt negatives are put is for squeegeeing prints to; and yet they make the best possible surfaces for trimming prints on. Placed film-side upwards on a table, the cutting knife bites into the gelatine, and renders slipping impossible. When the gelatine is wholly destroyed, the plate can be cleaned in boiling water, and is then fit for use as a print-glosser.

Then there is another useful article which is generally thrown away. I refer to the waxed paper in which plates are usually packed by the makers. I know of nothing which is so useful for mounting prints with, whether the latter are wet or dry. Placed on the top of the print after the latter has been arranged in position, a flat or roller squeegee can be passed safely over it without injuring the surface of the print in any way.

Another use to which this waxed paper may be put is to place it over the printing frame when weak, thin negatives have to be printed from. The black paper which is also often wrapped around plates by the makers, is useful for many purposes. It is good for placing in the printing frame when lantern plates are being printed by contact. It prevents a considerable amount of halation. Skilful amateurs can also utilise it for cutting out masks for negatives and slides.

I suppose most people know that spoiled celluloid film negatives are admirable for squeegeeing prints to. They give a fine gloss, and the prints are easier to remove than from glass plates. They are also good for making diagram lantern slides from with the aid of a sharp steel point and some Indian ink.

The brown envelopes which form the inner wrappers of our packets of P.O.P. are excellent for storing valued negatives in. One negative is placed in each envelope, and then, if the name and number of the negative are written on the flap, and the latter left hanging open, they are easy to refer to. If the negatives are stacked one on top of the other in these envelopes, there need be no fear of dust.

One more 'tip,' and I have done. Those who do not bind their British Journal of Photography, and yet wish to keep the numbers for reference, will find much convenience resulting from the following plan:—Take twenty-six weekly numbers—the half-year—and place them in a neat level pile on the table. Then secure two pieces of flat lath, each as long as the paper, and place one on the top and the other at the bottom of the pile. Four inches from each end bore a hole through laths and papers, and pass a piece of whipcord through both holes, secure the ends, and leave a loop. Then write the date of the first and last number on the lath, and, with the loop, hang the completed file on the wall. It takes up little room, is no trouble to make, and is of immense convenience.

INTENSIFICATION OF ALPHA PLATES.

By W. P. Wiseman.

There are doubtless many who, like myself, are admirers of the warm tones so readily obtained on Alpha plates. No plates, in a general way, are more easy of management, but, when dealing with thin negatives, I have found great difficulty in getting sufficient density, and at the same time a pleasing warm colour. I tried the various methods of mercurial intensification, but without success. It then occurred to me to try pyro and silver as used for collodion; this I found, if properly used, to be a perfect agent. The formula used was pyro 5 grains, citric acid 12 grains, water 1 ounce, to which add a few drops of a solution of silver nitrate. The first trial was not encouraging; the picture was intensified, certainly, but it also left the plate and increased to twice its normal size. A few minutes in a saturated solution of alum, followed by a good washing, prior to the use of the pyro and silver, prevented any repetition of this behaviour. I can now make capital transparencies from the thinnest of negatives, for the veriest ghosts can be worked up to any desired extent, and with the greatest ease and certainty. Thinness of image arising from over-exposure can be as easily corrected, any fog being first cleared off with the Howard Farmer reducer. This plan I have found particularly useful in the reproduction of steel engravings and line subjects generally. The colour of the picture does not seem altered, and intensification can be as well carried out after toning as before. The majority of the readers of the Almanac are probably already well acquainted with all this, but there may be a few to whom the method is new in its present application. To such I strongly recommend a trial of its virtues, for it has enabled me to make satisfactory transparencies from negatives I could never have utilised otherwise.

THE NEW ART.

By E. Rawstorne.

The struggle for existence between photography, pure and simple, and photography plus artistic manipulation, has arrived at a point which shows, not only the possibility of their existing amicably together, but also of deriving that aid from each other which reason and better knowledge teach us to expect in the future.

The publishers of illustrated periodicals have carried plain photography as far as it is safe to do so without serious injury to themselves, and have found that they must call in the artists again or go to the wall. In the mean time, we must expect a continuance of that wrangle which has broken out between those who have assumed too much of so-called art in photography, and those who, from ignorance of principles, jealousy, or malice, assert the utter impossibility of using the photographic print as a groundwork for an artistic picture.

With this acrimonious conflict I have little sympathy, but should like to make a few remarks upon something overlooked in this war of words.

Is it not a fact that the principal reason of the great progress made in modern art has been the result of a closer and more appreciative study of that nature, which seems to be held in such contempt by some considerable body of the disputants? That photography has materially assisted in this matter there can be no doubt, and will continue to assist, whether some people like it or not. That nature can be improved upon at its best is about the most stupid fallacy that has ever afflicted art, and those who have studied her in sincerity and truth know how far short they fall in their attempts to picture her as she really is, in the glorious beauty of a sunset or the quiet tenderness of a delicious moonlight night.

There is a loud and haughty verbiage about invention in art and other principles, as though those who arrogated to themselves the lofty title of artist were alone possessed of them, alone entitled to the prerogatives of exclusive ownership; all this is shallow cant. The grand principles underlying art are, like all true things, based upon nature; man makes his selection and adapts them to his needs; they are not the exclusive property of any class of persons. I have seen more art displayed in the arrangement of a little room than in an acre of oil paintings, and more invention manifested in a clothes-peg than there is in hundreds of Academy exhibits. All this proves little or nothing, but the utter folly of those who claim too much and those who concede too little.

Those amongst us who are conversant with the practice of photography, and who have also studied as artists, know how strongly their art-knowledge influences them in selecting, modifying, blocking out, and even in adding to their camera studies, with the result that the original photograph in effect is so changed that it has become entirely subordinate to the individuality of the artist himself, in fact there is more art in some of these monochromes than in the more pretentious spread of pigment by well-known painters.

Photographers object to this as spoiling photographs; pseudo artists as degrading art, while its practical exponents claim it as a new departure, which is destined to meet the wants of the coming age.

Invention is not only possible in photographic combinations, but has already been put into practice, and will be largely used in the future. That some cannot, or will not, see it, is evident enough, but that is not so much the fault of the artist photographers as the ignorance of what constitutes art in those who pose as its judges. There are plenty of so-called artists whose knowledge is simply acquired verbiage of the parrot kind, without soul or understanding, yet think that pretentions with considerable waste of pigments, canvas, and brushes, places them in a position as oracles in matters of taste and judgment. There is little to gain by a victory over such persons in words, much better will it be to answer with improved and better work, and leave the decision of it to that public opinion which can be the only arbiter in a matter of this kind.

'LUX IN TENEBRIS.'

By G. H. E. Sutton.

'And God said, Let there be light: and there was light.'—*Gen.* i. 3.

In the beginning God created Light.
From depths of chaos, far beyond all reach
Of mortal vision, and from spheres sublime,
Yet wrapped in shades impenetrably dark,
At the Almighty word of high command,
From the Eternal Throne there issued forth,
In living streams of mystic, wondrous power,
Far-reaching through all space, and giving life,
And charm, and beauty, to revolving worlds—
Thus magnifying its Creator, God—
Light! The sweet harbinger of joyous day,
Borne on the pinions of a virgin morn
Through the vast confines of eternal night,
Filled the dark void of nature; now no more
Invisible, but manifest to sight
In manifold array, a beauteous scene!
More precious than the gold of Ophir; and
More chaste than falling snow; swift as a thought,
That wingèd Pegasus of every soul;
Playing the wanton on a maiden's cheek;
Painting the tulip; gilding the distant hills;
Piercing the crystal; giving life and joy;
Stronger than Titan; gentle as the dew;
Moulding the counterfeit presentment by
Most subtle art; and, with magician wand,
Limning creation to its utmost bound.
O emanation of the Power Divine!
Ethereal essence; all-pervading source
Of pleased emotion to the willing sense;
Revealer of all nature; by whose aid,
Recording all its phases to the sight,
Life is the bud of Immortality.
Beholding thee, and basking in thy smile,
Princes and people joy to give thee hail!
Hail, glorious Light! Hail, heaven-born boon to all;
But chiefly man: that with pellucid ray
Dost trace and grave for all posterity.
Hail, bounteous gift! creation's fairest gem.
We hymn thy power to captivate the soul;
And praise thy Giver for our daily bread.

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A FEW EXPERIMENTS WITH FORMALIN.

By Lt.-Col. Gubbins.

In The British Journal of Photography of April 26 last, there was an article on 'Formalin,' and as I have been somewhat troubled with—

what I thought was—frilling, but which might have been incipient decomposition of the film, I thought I would try a few experiments with formalin, to see what effect, if any, it would have.

I first tried the very minute addition of one drachm to four ounces of developer, thinking that the length of time that the film was acted on would make up for the extreme dilution of the formalin, but it did not appear to have any effect, and there was a crop of blisters about the size of small pins' heads, running in a band across the negative.

I made further additions of formalin to the developer, without checking the formation of blisters, until it was 1 to 7, when it completely spoiled the negative by fog.

I then tried the addition of formalin to the fixing bath. The addition produced no immediate effect on the hypo bath; but some of the mixture that I left in an uncovered glass measure, in the course of two or three days, threw down a white precipitate, the nature of which I am not sufficiently good a chemist to decide.

Next I tried the effect of treating the film with a dilute solution of of formalin before developing. For this purpose I followed the lines of the experiments recorded in the article mentioned, and let a solution of 1 to 7 act on the undeveloped film for rather over two minutes, then washed the film under the tap and developed. I developed two negatives which were of the same batch, and exposed for the same length of time on the same subject, within a few minutes of each other. The one treated with formalin had an unusually heavy crop of the small blisters, and in the washing, after fixing, frilled very badly, in fact the film nearly came off; the other, untreated, had very few blisters, none worth troubling about.

One peculiarity I found of formalin was, that the fumes (or smell) of it, especially those from the mixture with the hypo solution, caused violent sneezing, although they did not seem to be pungent, and the effect on the skin of the fingers was very disagreeable, making it feel peculiarly harsh and rough.

ENAMELLING OF SILVER AND GELATINE PRINTS.

By Albert Hindley.

In response to your invitation for an article for the Almanac, I have chosen (after looking through the papers for the past year) a subject which seems to perplex a good many of our photographic friends, and that is 'the Enamelling of Prints.'

There are several good methods which may, with care, be used to get good results. I will touch on one or two, and at the close give my own method as pursued by me for the last fourteen years.

The first most simple method is: Take a piece of glass, either plate glass, old negative, or any piece of good glass with even, level surface, thoroughly clean, then dust with powdered French chalk, and polish well. Having first got your print in soak, take the glass and place it in the water where you have the print, bring the print in contact with the plate, and withdraw them from the water, and by holding the plate in a vertical position whilst so doing the print will adhere and no bubbles will be formed; place the plate on a flat table and squeegee, and let dry thoroughly, when the print will strip easily and may be mounted by cementing just round the edge of print to preserve the surface of print, and holding in contact with mount until dry to prevent curling off. Or, instead of allowing to dry on the plate after placing the print in contact, a good plan, and one that enables the print to be cemented all over when dry, is to paste to the print whilst on the glass, and place a good piece of note paper with ivory surface (or some prefer the prepared print backing paper) over the print, and allow both to dry before stripping. The enamel surface of the print is thus preserved without much precaution having to be used in mounting.

The second method I would bring before your notice is to prepare the plate as in the foregoing process, and then coat with a good enamel collodion, be sure and get enamel and not negative or positive collodion, as the last two do not answer as well as the first, but I find the best plan is to prepare my own collodions whether for enamelling or for wet plate processes, and my enamel collodion is made up as under (I give quantities for a good trial) :—

Soluble gun-cotton	12 grains.
Sulphuric ether	1 ounce.
Alcohol	1 ,,

Mix.

The gun-cotton must be dissolved in the sulphuric ether, and then the alcohol added. Keep in closely stoppered bottle, and allow to stand a short time when freshly prepared before using.

The plate is coated with above, and allowed to set for a short time, where there is no dust. Slide the prepared plate face up into the dish which contains the print, draw the print on to the plate and proceed as in the former case to squeegee the print into contact, and set aside to dry, backing the print or not according to the judgment of the operator.

The third process is not a collodion process, but a wax and gelatine process of enamelling worked out as follows :—Take a piece of glass with smooth surface free from scratches, clean it well, and then rub over the glass the following preparation with a tuft of cotton-wool or a piece of soft flannel.

Best white wax	20 grains.
Best benzine	5 ounces.

Dissolve.

See that the glass is thoroughly smeared with the solution, afterwards polish the glass surface with a soft cloth. The next requirement is a gelatine solution prepared as follows :—

Fine hard gelatine	¼ ounce.
Hot water	20 ounces.

Soak the gelatine in cold clean water for a short time, then take it from this and put it into the twenty ounces of *hot* water, which has been poured into a jug or suitable vessel, stir well with a glass rod until dissolved. Then filter through a piece of linen or flannel, and immerse the prints whilst warm for about five minutes, then drain, and lay it picture side downwards on the waxed surface of the glass, then cover with a piece of blotting-paper and squeegee into contact, making sure that no air bubbles are left between the two surfaces when left to dry, and when absolutely dry strip from the glass in usual manner, and you will then have a fine hard and brilliant enamel surface. Be sure to allow the print to dry thoroughly or the result will be a failure.

The fourth method of enamelling is my own special method by which the very finest results can be got. The glass in this case must be cleaned exactly as before, then talced, and the talc must be rubbed with a tuft of cotton wool in a circular motion lightly, until no traces of the powder are seen. This gives it a surface which causes the collodion to be easily removed from the plate without sticking. Flow the plate with collodion made as follows :—

Gun-cotton	30 grains.
Sulphuric ether	4½ ounces.
Alcohol	3½ ,,
Castor oil	24 drops.

Let the plate dry, and now immerse the prints in a solution of gelatine made as under :—

Fine hard gelatine	1 ounce.
Water	8 ounces.
Glycerine	50 drops.

Put the gelatine and glycerine in the water and let it stand all night when it will be ready for use, after filtering, which may be done by warming the solution sufficiently to render it limpid. After immersing the print for five minutes, take out and place in contact with prepared plate, squeegee and allow to set for about an hour, when they must be mounted, using gelatine for the purpose, putting it on the back of the print with a brush, and placing the mount on the print keeping it in position by placing a weighted glass on the mount, sufficient to keep it down on the print where it must remain for fifteen minutes, it must then be taken away and the print allowed to dry thoroughly and without the aid of heat. Frequently the prints done this way come off the plate themselves, but, if not, by running a knife blade round the edges they will easily leave the glass

I have now given four very useful methods easily worked by any one of ordinary capacity who is careful, and at the same time thorough in his working. I have not mentioned in the forepast of my article the other means that may be adopted to gain the same end viz., a plain enamelled surface to the print, but most of my readers will know how to use the vulcanite slabs, ferrotype plates, enamel plates and hard rubber, and know that failure is as a rule the result of using these articles. I would therefore ask those who have not adopted the collodion or wax and gelatine methods to do so, and they will feel amply repaid with the results.

ENAMELLED PRINTS.

By Thos. Rogers.

To wax glass and to obtain a brilliant surface to any gelatine paper, whether bromide paper or gelatine chloride, proceed as follows :—Use polished plate of brilliant surface, absolutely free from scratches, and absolutely clean. Warm the plate slightly, and rub roughly over it a lump of pure beeswax, take a dry soft flannel rag, warm the plate until the wax melts, and with the rag rub it all over the plate until every portion of the glass is covered. As soon as you are sure of this, commence to rub the wax off again on to the flannel, rubbing lightly in a circular direction and all over the plate, so that one portion is not left thick with wax when another portion is clean glass.

When the wax has almost disappeared from the glass, take another flannel, clean, to give a final polishing. Use this exceedingly lightly, and stop as soon as ever the wax becomes invisible over the whole surface of the plate glass. At this stage the glass will be evenly coated with an invisible film of wax, and will have a most brilliant surface. Further rubbing or hard rubbing would entirely remove the wax from portions of the surface causing the prints to stick to such portions. Take the prints wet from the final washing, let them drip to remove the excess moisture, then lay them, one at a time, face downwards on the plate glass, gently but firmly pressing them into contact, and removing all air bells by the application of the squeegee.

When all the prints have been squeegeed on to the glass it can be stood on end in a dry, slightly warm place, and, when quite dry, the prints will peel off by themselves. If a print sticks, gently raise one corner with a knife and draw it off. If, when quite dry, the prints stick to the glass so as to tear in drawing off, it proves that the waxing was inefficient. If the waxing was properly done, the prints should leave the glass perfectly clean. Polish it with a dry rag, and it is ready for the next waxing. If thoroughly and carefully waxed, about a dozen times of using will get the glass into a " ripe " condition, so that several batches of prints may be squeegeed on to it without further waxing.

Some prefer ferrotype plate or papier-mâché slabs. I am strongly in favour of the polished plate glass, and of wax rather than talc, for waxed glass is the most certain method.

BROMIDE PRINTS BY CONTACT, FOR WINTER EVENINGS.

By William Ouin.

Now that the winter evenings are upon us, and outdoor photography not so practicable—owing to the dull and uncertain weather and short days—it behoves us to turn our attention to some other section of this interesting subject for the long evenings, or such of them as we can spare for our hobby, and I do not think that we can do better than take for study the subject of positive pictures on bromide paper. This class of picture lends itself well to artistic photography, and it is deserving of greater popularity than, I think, it at present enjoys. For small pictures the *smooth*-surface paper is the best, whilst larger pictures undoubtedly have a better effect on that with a *rough* surface, providing the subject and class of picture admits of it. There are some large pictures which, I think, look better on the smooth ; but, to a great extent, this is a matter of taste, and should be decided by the character of the work.

For the amateur who has had no experience whatever in contact printing on bromide I would advise a systematic study of small pictures, say from quarter-plate or 5 × 4 negatives. Choose your best negatives, and practise with these till you can produce a satisfactory picture, and you will be astonished how nice they look when completed and mounted in an album, or, if you prefer, on small plate-sunk mounts, with India tint.

Having decided on the paper you will use (for there are several brands in the market now, by the Eastman Company, Illingworth's, the Paget Prize Plate Company, Morgan & Kidd's, and that known as the Ilford), take the packet into the dark room, and take out one piece and place it face downwards on the negative in the printing frame, fasten it up, and carefully keep it from light till you are ready to expose it. Now comes the question of light, What light is best to use? The answer to that question must be governed by circumstances. Of course, a standard light is best, as by such a light, once you get the proper exposure, all things being equal, you can rely on getting good pictures every time you expose; or, should you over or under-expose a little, you can command a fair result by intelligently using your developer.

Well, to settle upon *a light.* I will presume that you have got a good paraffin lamp, with a globe chimney, the lower part of which has been ground (this is better than plain glass). Hold your printing frame at a distance, according to the density of the negative you are using, of, say, twelve to fifteen or eighteen inches from the light, for fifteen or twenty seconds, or, if a dense negative, even thirty seconds. The correct time can only be arrived at by experimenting; but, once you have obtained the correct exposure, you can regulate your future exposures to a nicety. Having made the exposure, you return to the dark room and take out your exposed print from the frame to develop.

Here let me remind you to have your dishes and glasses *well cleaned*, and, if possible, have a dish for each solution, namely, the developing solution and the fixing bath, and a large dish for finally washing the prints in running water.

The *best developer* for bromide prints is, undoubtedly, the *iron developer.* It may be made up as follows:—

No. 1.

Oxalate of potash	4 ounces.
Water	16 ,,

No. 2.

Sulphate of iron	4 ounces.
Water	12 ,,
Citric acid	50 grains.

For developing, add one drachm of No. 2 to five drachms of No. 1, and add a drop or two of a ten per cent. solution of bromide of potassium; or, as I have made it for myself, say:—

No. 1.

Oxalate of potash	4 ounces.
Water	20 ,,

No. 2.

Sulphate of iron	4 ounces.
Water	10 ,,
Oxalic acid solution	1 drachm.

I take of this two drachms of No. 1 and add to six drachms of No. 2, using the bromide of potassium solution as necessary, according to how the picture comes up.

Of course, you cannot gain perfection at once; but *perseverance* is a *good lever* towards that end. Failures you must not allow to dishearten you, but rather stimulate you; and, if through its various stages your interest is not allowed to flag, you will doubtless become master of this most interesting branch of photography, and which will not only be a source of much pleasure to you, but also a means of instruction to something higher and more ambitious—in fact, a stepping-stone to making *your own enlargements.*

A NOVEL WAY TO FINISH TRANSPARENCIES.

By Alfred I. Taylor.

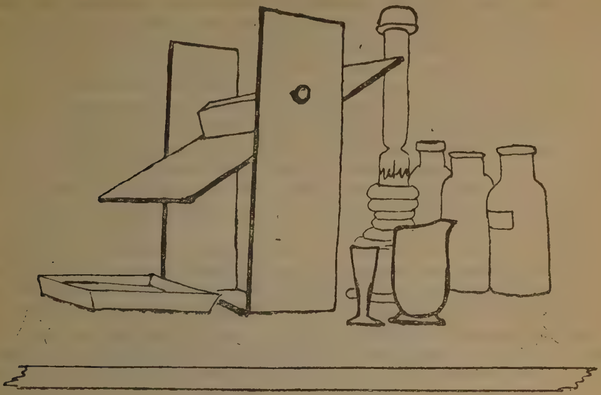
Transparencies finished in the following manner make rather pretty ornaments. The transparency can be made by using carbon transfer, Eastman's transferrotype paper, or the wet-collodion process. The picture is either developed on or transferred to sheet glass, and allowed to dry. Those who wish a margin round the picture must now clean it off. If the transparency is made by the collodion process, it must be coated with spirit varnish, but those made in carbon or transferrotype do not require this. The picture is then laid face up on a flat table, and the whole surface of it rolled over very thinly with lithographic varnish. After this, bronze, silver or coloured powder is dusted all over the surface, and the excess removed with a camel's-hair brush. Allow the picture to stand and dry for a couple of days, and then flow over with spirit varnish. When this is dry, it is ready for mounting either in a plush or dark frame, or if bevelled glass is used, place the picture on a board covered in plush, and fasten down with brass nails at the corners.

IN THE DARK ROOM.

By Leonard Crosslé.

The Lamp.—One of the most important points in connexion with the dark room is the question of its illumination. Few, if any, of the dark-room lamps at present on the market are entirely satisfactory. A perfect lamp should give a good general illumination of the room and at the same time a strongly localised illumination of the plate. The eyes of the worker should be completely shielded from the fatiguing glare of the direct rays from the flame, and the plate ought also to be protected from the direct rays, except when under examination. At the same time one wants a good general light in which to compound and modify developing solutions and identify bottles and packages with ease and comfort.

I do not know of any existing lamp which satisfactorily fulfils all the above conditions, but an ordinary Argand lamp, fitted with a red or yellow chimney, may be made to do so with the help of the following simple piece of apparatus, which any one can construct for himself in a few minutes and at a nominal cost:—



Get an ordinary deal box, made preferably of quarter or three-eighths inch wood, and measuring about twelve by eight inches by four to five inches deep. The *exact* size is not material. Remove the bottom, the lid, and one of the ends. Plane down one of the sides of the lid till its width is a trifle less than the inside measurement of the remaining end. Now fix a piece of scantling, about one inch by one inch, cut to the width between the sides, across the lid, as shown in the illustration. Get two cheap screw handles, such as are supplied with cheap sets of drawers, and bore a hole in the centre of each side about two-thirds of the way up. Similar holes must now be made in the centre of each end of the cross piece on the lid, the screw handles can then be inserted and screwed up tight. We have now a rough imitation of the ordinary swing looking-glass, which can be placed between the lamp and the developing dish.

When the shade is in a vertical position or inclined away from the light, the plate is completely in shadow, while the rest of the room is more or less brightly illuminated. When the shade is inclined towards the lamp, the light is reflected down on to the developing tray, but screened from the eyes of the operator. A revolution of the handle is all that is necessary to turn the light on or off. The plate need only be exposed to the direct rays of the lamp for a few seconds at a time, and, even with a very low illuminating power, no difficulty will be found in following the slightest changes which occur during the process of development. Not long ago I broke my red chimney just as I was about to begin the development of some rapid isochromatic plates, leaving only a light yellow one—generally used for bromide paper—to fall back on. I found that with the yellow light it was quite possible to follow the development in the shadow, and obtained negatives which were as clear and free from fog as possible.

Preservation of Chemicals.—One of the bugbears of the amateur photographer, who generally works more or less by fits and starts, is the difficulty of being sure that his chemicals are in good condition when he resumes work again after a considerable interval. When he takes down a bottle from the shelf on which it has stood for weeks in the vitiating atmosphere of a damp or ill-ventilated cupboard, there is generally a pleasing uncertainty as to the state of its contents. A flaw in the cork or an ill-fitting stopper may have helped to reduce his sulphite of soda to a snowy sulphate, his amidol to a mass of rusty black crystals, or his ammonia to an innocent and odourless fluid whose specific gravity is far, far from what it ought to be. Worse still, however, is his fate, when the change is one which is imperceptible to the eye or nose, and is only discovered when some disastrous failure in practice can be traced to no other source.

The following is a simple and effective means of avoiding troubles of this nature: Place four ounces of paraffin wax in any wide-mouthed jam-pot which can be permanently spared from the family store cupboard. Put the jam-pot in a small saucepan half full of hot water, and boil till the wax is completely dissolved. Dry the mouth and cork of the bottle which it is desired to seal, and dip it into the melted wax for a second or two. The cork should not project more than a quarter of an inch or so above the mouth of the bottle, and the wax should be at least half an inch deep in the jam-pot. Corked bottles treated in this way are far better than even the most expensive stoppered ones.

A Method of Backing Plates.—Plate-backing is generally considered a messy and troublesome business, seldom worth the bother unless one is about to undertake an interior with windows or other difficult subjects in which the halation fiend is likely to take a hand. As a matter of fact, it is hardly too much to say that, if we desire the best results, no plate ought ever to be exposed on any subject whatsoever without first being properly backed. Even that chartered libertine, the hand-camera man, whose longest exposure rarely exceeds one-twentieth of a second, cannot wisely dispense with this precautionary measure. It is a mistake to suppose halation is entirely, or even mainly, dependent on length of exposure. On the contrary, it is precisely in forcing an under-timed plate that it is most likely to show itself if inherent in the subject. Some of the worst and most irritating cases of halation which I have met with have been on plates which had received less than one-fiftieth of a second exposure.

The following can be recommended as a simple and cleanly method of plate-backing :—The frame of an old focussing screen, of the exact size of the plate to be backed, is screwed tightly down on to a piece of half-inch board covered with black cloth or velvet, about two inches larger than the frame all round. The plate is placed film downwards in the rebate, the glass surface being then perfectly flush with the top of the frame. A *small* quantity of Forester's Effective Backing (which can be obtained of any dealer in eighteenpenny collapsible tubes) is squeezed out on to the plate, and *at once* spread evenly all over it by means of a small tampon of cotton-wool encased in thin linen. A *light*, *rapid* circular movement of the tampon is necessary in order to distribute the backing evenly before it has time to get tacky. If the operation is properly carried out, about thirty seconds' fanning with a piece of stiff cardboard will suffice to dry the backing into a hard, tough coating, which will not chip or grind into powder, and the plate may be at once transferred to the sheath, magazine, or slide. If too much of the backing has been used, or it has been spread unevenly, the plate should be transferred to one of the grooves of a well-seasoned negative box, which has been thoroughly dried in the oven, and the lid of the box shut down to exclude light. Plates so treated will dry in a few minutes.

The advantages of the above method are, (1) that the backing cannot possibly get on the surface of the sensitive film; (2) the plate receives the smallest possible exposure to the light of the lamp; (3) the backing can be well worked into the corners and round the edges of the plate without soiling the fingers; and (4) the plate is held firmly on all sides without any danger of injury to the film.

The backing can be removed in a moment with a wet sponge, or, if left on the plate, will dissolve off in the developing dish, and is chemically inert.

If an old focussing screen is not available, a rough, unpolished one, obtainable at a small cost from any of the firms who advertise parts of cameras for home manufacture, will answer the purpose perfectly.

INVERTED ALBUMEN.

By Edwin Banks.

The uses to which albumen is applied in photography are numerous, and, doubtless, familiar enough to most of your readers. As a coating for paper in the printing process it has had a long and uninterrupted reign, until the advent of gelatino-chloride papers, which, from the simplicity and ease of manufacture and manipulation, have almost completely routed albumen from the photographer's workshop. Hitherto the application of albumen has usually been confined to its use in its normal condition as obtained from the egg, and it is of egg albumen I am writing now, and not blood or vegetable albumen. The white of egg consists of nearly pure albumen bound together by fine, delicate cells. By beating up these cells are broken, and the albumen is set free, whilst the tissue of which these cells are composed, being insoluble, may be filtered out. Of the chemical constitution of albumen I do not propose to write, and its physical characteristics I will only just touch upon, being well known to every one. These are its solubility in cold water and dilute alkalies, whilst most metallic salts, alcohol, mineral acids, or the application of heat at about 160° Fahr. coagulate it and render it insoluble. But there is a preparation of albumen in which all these characteristics are reversed, and it appears to me that there might be yet an extensive use for this substance in many photographic operations; and although not by any means new, having been repeatedly referred to in The British Journal of Photography, yet few seem to be aware of its valuable properties. To prepare the albumen, take the white of any number of eggs, carefully separating the germ or any yolk from it. Do not beat up the albumen, which entails a considerable loss in froth which will not settle, but to each egg take two drops of glacial acetic acid, diluted with half a drachm of water, and add to the white of egg with constant stirring. Allow to stand for an hour. This will dissolve the cellular tissue which binds the albumen together, and it will become quite fluid. At the end of the hour have ready a thirty-grain to the ounce solution of potassium or sodium hydrate in water, and slowly add this drop by drop, with constant but gentle stirring so as not to raise bubbles. After a certain quantity has been added the albumen will begin to show signs of thickening. When this occurs add no more alkali, but allow it to stand for ten minutes. At the end of that time the whole will have set to a clear, firm jelly, looking exactly like gelatine in a similar condition. Now take out of the basin and squeeze this jelly through the meshes of coarse canvas, exactly as you would so much gelatine emulsion. Gather on to a piece of fine muslin loosely stretched over a flower-pot. or any other contrivance you may have handy, and well wash with running water for four or five hours. This should be thoroughly done to eliminate all the alkaline hydrates. So prepared this albumen has very different physical properties to what it originally had. Although insoluble in cold, it dissolves readily in boiling water. It is no longer coagulated by alcohol, but freely dissolves in it by the aid of heat. From its solution in alcohol it is precipitated by ether as a fine powder, which is again soluble in water and alcohol. All metallic salts precipitate it and coagulate it into an insoluble form, but, unlike ordinary albumen, it is in an exceedingly fine state of division. An aqueous or alcoholic solution poured upon glass and dried gives a film which adheres with great tenacity, and is absolutely insoluble in either water or alcohol, or in either acid or alkali. All alkaline salts dissolve in its solution, but acids of any kind, even acetic or citric, at once precipitate it.

From this summary of the peculiarities of this inverted albumen your readers will easily see many useful applications of it. Its alcoholic solution, if free from water, forms a splendid organifier in collodion emulsions, either for negative or lantern-slide work, or for printing out collodio-chloride. It makes a perfect substratum for the gelatine in collotype printing, especially with the addition of a few drops of silicate of soda or potass. It may be added with advantage to gelatine emulsions, giving special properties to such plates, which space forbids me to enter into. As a substratum for collodio-chloride on paper it does away with all blisters and broken films, and an aqueous dilute solution forms an ideal substratum for collodion on glass. Its minor applications are numerous, and will occur to everybody. Its insolubility when dry makes it of great value in many instances. As an adhesive for fastening labels on bottles in the damp of the dark room, or for rendering paper temporarily waterproof for experimental purposes, &c. I need not dwell upon this any further. My advice is, Keep it by you.

ANTHROPOLOGICAL PHOTOGRAPHY.

By M. V. Portman.

One of my acquisitions this year has been a No. 2 binocular camera, and this I can recommend to explorers. The point of sight is good, and for snap-shot work it is excellent, though I should not use it for anything else.

People are apt to fancy that, owing to the heat as well as the glare of the sun in the tropics, the actinic value of the light there must be correspondingly great, and that everything can be taken with a drop shutter, but I have not found this to be the case. During the dry season there is a great deal of yellow haze which affects the light considerably, and 'cloudy weather' and 'under trees' have the same significance regarding exposure whatever the latitude may be. On the whole, I should recommend longer exposures, even in the best tropical light, than are given on a bright English summer day. In no science is the camera coming more to the front than in anthropology, and amateurs who can photograph but do so aimlessly have a field of very useful work therein. Even in England there are customs and handicrafts which are fast vanishing, and are worth preserving by the camera, and abroad in savage lands the harvest is plenteous and the labourers are almost entirely absent.

As I have recently written at some length on 'Photography for Anthropologists' in the August number of the *Journal of the Anthropological Institute*, I will now only refer the would-be worker to that publication.

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SOME NOTES ON ENLARGING.

By John A. Hodges.

That the practice of enlarging is becoming increasingly popular, the walls of any public exhibition of photographs at the present time will afford abundant testimony. Nor is this a matter of surprise when the two methods of producing large photographs—that is to say, taking a direct negative of the required size, or enlarging to that size from a much smaller original—are compared. The weight and bulk of the apparatus required in the first case places serious limitations and restrictions on the landscape photographer, whose habit it is to roam over hill and dale in search of the picturesque, whereas a small and compact quarter-plate camera may be carried anywhere and everywhere without causing fatigue. The writer has so long and persistently advocated this system of working, that reiteration is perhaps uncalled for, his desire on the present occasion being to direct the attention of readers of the Almanac to two points of detail in the production of enlargements, by an observance of which the technical quality of the work may be greatly improved.

The first is the introduction of lenses capable of giving, over a moderately large angle, a field at once flat and free from astigmatism. It will probably be conceded by even the most rabid of 'impressionists' that whatever advantages (?) an 'out-of-focus' negative may possess, from a pictorial point of view, for direct or contact printing, with one that is intended for subsequent enlargement sharpness is a *sine-quâ-non*. Without in the least wishing to disparage the performance of a type of lens that has done such good service to photographers for so long a period, every practical enlarger is aware of the difficulty which is experienced in getting a crisp and evenly defined enlargement of a subject taken with such a lens when a large aperture has been employed, and how rapidly the definition falls off towards the margins. If the same subject be taken with a flat-field objective, the enlargement being produced with the same lens, the improvement in quality will be of such a marked character as to fill those previously unacquainted with the remarkable properties of these new optical productions with surprise. There can be no doubt that, working in the way suggested, enlargements may be produced which it would be impossible to distinguish from direct prints. There are now in the market many lenses claiming to possess absolute flatness of field. The claim is justified to a greater degree in some than in others. After a careful and comparative trial the writer has chosen a Ross-Goerz, an instrument in which all the attributes referred to are found in a high degree, and which possesses the advantage over some of its rivals that, being symmetrical, either combination can be used alone as a single lens of rare excellence.

The second point to which it is desired to draw attention will be of interest to a large body of amateurs, and professionals in a small way of business, who do their own enlarging and employ for the purpose some form of artificial light. The majority probably use an oil lamp in some form or other, and those who have done so well know what a constant source of trouble such an illuminant proves in practice to be. Let those so circumstanced substitute an 'S' incandescent gas burner for the oil lamp, and not only will their troubles cease, but a manifest improvement in the quality of their work will result.

HOW TO RESTORE PLATINOTYPES.

By W. J. Belton.

Having had a quantity of platinotype prints through my hands lately that were done some three years ago, by an inexperienced person, and in some way not properly finished (they were the rough paper, and the skies and high lights very yellow, which rendered them of no value), I decided to try a few experiments, my object being to restore them, if possible, to the purity of fresh platinotypes. As the results I obtained may be of use to some reader of your Almanac, I venture to describe the method I adopted.

Take eight ounces of the common chloride of lime (as bought at an oil-shop), put into a Winchester bottle, add eighty ounces of water, and shake well. Allow to stand a few hours, and decant off the clear solution into a dish. After well soaking the platinotype prints, place a few at a time in this bath, keep them moving, and, when the yellow tone is bleached out and the whites pure, remove and well wash; then give them ten minutes in the hydrochloric acid bath, as used in the platinotype process, wash again until free from acid, and dry between blotting-boards.

The prints thus treated, when placed by new ones, printed and finished the same day, and done on the same make of paper, showed no difference, the blacks being quite as deep in tone and whites as pure. Of course, the chloride of lime bath is useless when the free chlorine is exhausted, and fresh must be used.

SUCCESSFUL WINTER PHOTOGRAPHY.

By A. CLARKE.

A FEW aids with regard to the above will, to a certain number of the readers, I trust, be of some use during the forthcoming cold, dark, and short winter days. What is required is to *decrease* exposure in the studio, and also to be able to develop *quickly* with the same ease, and comfort, and, I may also add, certainty, that is done during the summer months. Firstly, I will commence by advising the use of *quicker plates*—in other words, plates requiring shorter exposure; also the *heating* of the developer, which is of the utmost importance. You will find the development of a negative reduced to one quarter the time to what it would be if the developer was cold, especially during very cold or frosty weather. With regard to the composition of developer, it is, like a great number of things, a matter of taste; but, as far as my experience goes, there is nothing better than pyro and soda, or pyro-ammonia. I find the first-mentioned the best for isochromatic plates, which are good for certain subjects. Any amount of *density* or *softness* can be secured by adding a decreasing pyro. I also advise the increase of soda or ammonia, according to developer used, during dark days.

Now with regard to the *lens*, increase aperture by using a larger stop. Shift half your curtains off skylight, and, lastly, keep both side and top light clean. You will then find winter work much easier. I t u t the above will be of some assistance to a few, at any rate, of the readers of this valuable book.

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ETHNOGRAPHIC PHOTOGRAPHY.

By M. V. PORTMAN.

MAY I offer the following suggestions to the large army of excellent amateur photographers who are scattered over the world, and who are in a position to use their art (the most perfect and accurate recording process known) in the interests of science and for the benefit of posterity. Very many good amateur photographers are also Government officials, or other professional men and women, who are so situated as to have unique advantages for observing the peculiarities of savage races, the manners and customs of little-known or intentionally secluded people, and their methods of work, &c.

There is no necesssity for a big scheme of work being undertaken. Most amateurs who have brains and energy enough to be good photographers have also other accomplishments, and I offer the following as illustrations of the work which might be done:—

Burmese Musical Instruments.—The patala, or bamboo harmonicon, supposed to be one of the oldest instruments, and to contain the original scale of Burmese music, might be taken. A photograph should be taken of the rough wood and bamboo; three or four photographs should be taken of the workman shaping the wood, &c., showing his method of holding it and working it with his tools, and the parts of the instrument gradually approaching completion; a photograph of the finished instrument; photographs of the way in which the instrument is tuned and also played. Accompanying each photograph should be a carefully written description of it, noting any peculiarities in the method of work, what woods, tools, varnishes, &c., are used, the musical notation, &c.

The agriculture of semi-savage tribes, showing in a similar way, by photography, the methods of manufacture of their implements, &c. The manufacture of the pottery of savage races, costumes, tattooing.

The photographs should not be smaller than whole-plate, the prints should be in platinotype, mounted in albums, with the printed descriptive letterpress pasted underneath, and the albums when filled should be sent to Sir A. W. Franks, K.C.B., F.R.S., the British Museum, London, W.C.

Three plates per week would in a year or two result in a very valuable monograph on any subject, and now is the time to undertake the work. Before an advancing civilisation the savage races, and their arts and trade secrets, their peculiar customs, &c., are fast changing or vanishing, and, as in the case of the extinct Tasmanians, scientific facts are left unrecorded and lost for ever, for want of public-spirited and educated people to collect and record them.

Now, the amateur photographer must, from the amount of plates he wastes, be public-spirited, and those of the class I mention are always educated, so they are evidently indicated as the photographic recorders of the present and future, for science.

A copy of *Notes and Queries on Anthropology*, published by the Anthropological Institute, 3 Hanover Square, London, W., will assist any inquirer who is puzzled as to his subject.

AIDS TO RESEARCH.

By R. Child Bayley.

The feature of the year 1895 which attracts most attention from one who considers the policy and methods of photographic societies is the tendency several of them have shown to divert some of their funds to the purpose of aiding research by means of money grants. The Photographic Club, *seniores priores*, we learn, will in future pay the out-of-pocket expenses incurred by those who prepare a paper for reading before it; prizes are offered at the London and Provincial Photographic Association for the best papers, &c., brought up there, while the Photographic Convention of the United Kingdom announces itself the first to lay aside a definite proportion of its wealth to be awarded as 'grants in aid.'

The last-named Society has made the most radical departure, and one which, while betraying the best intentions, is by no means one universally approved by those most interested in such matters. The policy pursued in the past by the Royal Photographic Society has been to give, from time to time, pecuniary aid to investigators carrying out certain definite lines of research; but the amount of such help has varied according to the demands for it and to the resources of the Society, the latter reason having prevented for many years now the making of such grants. That such a system is better than one which advertises the fact that a certain sum is to be given away, and which offers a certain inducement to its administrators to get rid in some way or other of the funds at their command, is, at any rate, the opinion of the writer. Such funds are apt to create fictitious (we do not for a moment suggest fraudulent), or rather unreal, demands upon them, and in other cases give rise to many, and sometimes to just and reasonable, complaints as to their administration. One well-known fund was nicknamed, with some reason, as 'Professor X.'s Benefit,' and, speaking generally, most of these funds go to finance men whose reputation is already achieved, and rarely, if ever, to help the less-known, because less-advertising, workers.

Another serious objection which applies with equal force to all 'grants in aid of research' is summed up by saying that the kind of work to be accomplished cannot be bought. This criticism may be to some extent true, but, if judiciously administered, such funds *could be* the means of smoothing, in a real and practical way, the path of the impecunious experimenter, and by so doing would do much to advance the cause of the science they are intended to help. As a matter of fact, however, a glance into the accounts of those Societies that make such grants goes to show that the bulk of them pass into pockets which already contain quite sufficient to ensure to their possessors the necessaries of life, while the really poor student may whistle for any crumbs from these masters' tables.

It remains to be seen whether the Convention will steer clear of the pitfalls which are plentiful along its new path. With the able management it has been fortunate enough to secure during the last few years, it is quite possible that it may escape many that more august bodies on the same track have blundered into and remained in—it is hoped that it will. It has shown a real and lively interest in the welfare of photography in the step it has taken, and is entitled to all the credit which may accrue to it for so doing. Let us hope that the step—whether judicious or the reverse it remains to be seen—will, at all events, do it no harm, but be the means of benefiting both the Convention itself and photography at large.

REDUCING NEGATIVES.

By P. Everitt.

One of the difficulties in photography is to secure such gradation in the negative that the highest lights and deepest shadows may both be rendered in the print without sacrificing one for the other. Intensification and reduction are resorted to for this purpose if the negative is unsatisfactory, but how often without attaining the desired effect. Some years ago, by mistaking a solution of ferridcyanide of potassium for pyrogallic acid, which was in a similar bottle on my dark-room shelf, I found that the former salt, in conjunction with bromide of potassium, would reconvert the developed image into bromide of silver. Subsequent experiments proved that iodide or chloride of potassium might be similarly used. The process has since been used for the production of positives. Recently I had some negatives in which the contrast was rather too great. When the clouds were printed, the detail in the foliage was lost. It occurred to me that I might improve the printing quality by reconverting the image into bromide of silver. To four ounces of water I added half an ounce of ten per cent. solution of bromide of potassium and a few drops of a strong solution of ferridcyanide of potassium. After immersion, until the image was reconverted throughout, the negative was washed and dried, and it then gave a satisfactory print. The proportions of bromide and ferridcyanide are not important, but it is well to use as little of the ferridcyanide as possible, to avoid yellowing the film. I think this process will be found to give very good results where only slight reduction is required, and it has the advantage that the negative may be restored to its original state without any loss by redevelopment in the usual way.

THE DEMON POSER, OR A SAMPLE FACE.

By Wm. Theodore Parkes.

He posed him for his photograph. Said he, 'I want my face
Produced artistic, rendering all its varied lines of grace;
I want it not for vanity of goodly form to boast,
'Tis for a matrimonial ad. to sample through the post.'

He sat, and they did pose him twice with care, and they did mulct
Him in a crown, and printed it, with failure as result.
He called again. 'By Jove!' said he, 'you've played the bear with this,
My second eye has got a wink, the mouth has gone amiss!'

'Well, would you kindly sit again?' He sat, they sent it home,
And back again, and up the stairs they saw the stranger come;
'My lips you've screwed the other way, the eye is not much better;
I would not be the man to dare to post it in a letter.'

He sat again. 'Perhaps your hand would give a thoughtful tone.'
He brought the photo back again, and, with a captious groan,
Said he, 'You've failed to hit me off, for look what I have here,
The mouth is lost—it's all a hand that's focussed out of gear!'

'Well, rest your cheek upon your palm—ha! now I've got you right!'
They sent it home, he came again, 'Was ever such a fright?
The *carte* is toned as 'twere with drink, my hair is all awry,
My cheek is like a rubber ball that's pressed into my eye!'

'Well, we will make another try; but yet I must be bland,
Your mouth is large; it's well to hide it somewhat with your hand.'
He brought them back the *carte* again. 'You've drawn it bad; the pose
Has hidden half my face, and made a portrait of my nose!'

'We'll try again. Just give your face an action bold and free.'
Again he came with this complaint, 'This will not do for me.'
'Well, will you please to sit again?' 'For seven times I've sat.'
'You answer in the negative?' 'I'm positive of that.'

'The fact of it is this,' said he, and lit his weed to smoke,
'I did not really want a *carte*. It was my business joke;
I deal in indiarubber goods; a sample face is mine.
I'll take those photos every one for advertising line.'

RETOUCHING—WHAT IS IT?

By Redmond Barrett.

It may seem somewhat late in the day to ask the above question, especially when we consider the important position held by retouching in the production of the successful portraiture of the present day. Nevertheless, it is not so very much out of place at the moment as it may seem to the casual observer at first. I think I am fairly safe in stating that if fifty of our leading photographers were called upon to give their individual definition, as a satisfactory solution of the above, there would be very serious and contradictory differences in their various and independent opinions. I prefer to leave this matter in the hands of our leading *photographers* rather than the leading *retouchers*, because the former have practically the ruling of this matter commercially, whereas the latter have simply to follow the dictates of their employers. This, too, regardless of any opinion on the part of the retoucher who has the work to do. I have had a few years' experience in this branch of photography, yet feel absolutely obliged to ask each of my customers, when they favour me with an initial order, to kindly let me know the style of work that finds most favour in their eyes. I do not think it right that this should be so.

If a retouched portrait were to be criticised, what points in same would be likely to appeal most to the critic? Notwithstanding that it was a portrait, would the fact that the *likeness* was preserved—or lost—have any influence upon his criticism? Judging from much that is written upon this interesting subject, I really think it is more than a doubtful point. I feel sure it would be well for photographers as well as retouchers if there were some sound and definite limits fixed, so that all might have a standard of excellence to which they might cling with safety. I feel sure, too, that if faithful likenesses were more general, with just sufficient judicious flattery to make nature look at her best, there would be more life in the photography of the day.

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THE RETOUCHING KNIFE.

By Henry Cooper, Jun.

In drawing the attention of the readers of the Almanac to the use of the retouching knife I am fully aware that I am not the herald of any new discovery; my wish, however, is to emphasise the value of a power which up to the present time has been but scantily appreciated. I have at times heard several eminent photographers argue that to tamper with a negative in any way is unjustifiable; but however strong their arguments may be, I am quite sure of this, that the photographer who places business first cannot afford to regard such opinions too highly. Outside business each individual is, of course, at liberty to pursue his individual fad. Probably the most important point regarding the knife is, that it places in the hand of the retoucher a power which hitherto has been denied him. Formerly he was only able to modify the shadows, but by the careful use of the knife he has now control over the lights of a negative. Of course discretion must temper zeal. I would be among the last to justify anything like an unrestricted use of the knife; it is a power which, when carefully used where necessary, is well worth possessing, and my only wonder is that retouchers do not use it more. It is surprising to what an extent an average negative can often be improved by the judicious use of the knife; should the hair, eyebrows, or beard, show a tendency to be going grey, it is infinitely better to remove the grey hairs in the negative than to attempt to do so in the prints, where the work which it is necessary to put on each separate print will always show dull and probably come off. Should the head rest, or any other objectionable feature, show, it ought not to be a difficult matter to effectually remove all traces of the defect. Again, in the case of a slight double image or movement, it is sometimes possible with the knife and pencil to effectually remove one of the images. Most retouchers must have bad cases—especially with children—where the hand, arm, or foot, has doubled; with the pencil alone it is impossible to remove these defects, but with the aid of the knife, carefully used, the difficulty can be overcome. These are merely a few cases of the many which the retoucher meets with where the knife is a valuable adjunct to the pencil. Like retouching itself, it is an art that requires good eyesight, a steady hand, and incessant practice. I believe that special knives for retouching are sold for the purpose, but personally I have found the small blade of a penknife with a firm handle quite sufficient. To those retouchers who have not yet attempted to use the knife the following hints may be of some service. In the first place, it is important that the film be quite dry and hard, also that it be unvarnished and free from medium. In working at the desk it is essential to use a strong light to see by—the light that is sufficient to retouch by will be too weak to see to use the knife. Probably the most important point in using the knife is never to allow it to go right through the film; doubtless, at first, this will be found difficult to avoid, but with practice it will be found possible to cut half way through the film, or rather, to scrape it thin; to do this properly it is necessary to hold the blade of the knife at right angles to the surface of the negative, and reduce the thickness of the film by gradually scraping it away. Of course this is a somewhat delicate operation, and had better not be attempted on an important negative until thorough proficiency has been acquired. As I said before, nothing but incessant practice on unimportant negatives will produce success. To those, however, who do succeed in attaining the necessary skill, the trouble involved will be well repaid by the additional power acquired.

THE ELECTRIC LIGHT FOR PROJECTION.

By G. R. Baker.

There are still a number of lanternists and photographers who have only a faint idea of the requirements necessary to make that splendid illuminant—the electric arc light—available for their purpose; in fact, many think it such a troublesome and costly matter as to be quite out of their reach.

I shall endeavour to show, in a general way, how simple, useful, and economical this light is wherever the electric current is laid on, for given a lamp, or, as it is often called, a regulator, also a resistance, fuse, and suitable flexible connecting wire, the light can be obtained in an instant.

The most important item is, naturally, the lamp, for, although the electric arc light can be produced by merely bringing the points of two carbons (or other electrodes) in contact and then separating them (and this could be managed by holding them in the hand, if suitably protected), yet it follows that something mechanical is necessary to keep the carbon points separated at the best distance, and, for projection work, at a definite position relative to the optical centre of the apparatus. Where an operator is at hand, as in the case of lantern exhibitions, this adjustment can be of the simplest kind, for all that is necessary is for one of the carbons to have an automatic or mechanical feed up to a certain point, capable of being made central for height and distance from the condenser of lantern, whilst the other carbon is fitted to a holder, which is capable of being raised and lowered by hand so as to feed the carbon formed from time to time as it is consumed. Previous to 1893 the regulators suitable for projection were of such a size that they could not be well used in ordinary lanterns, and, besides, were costly; and it was the introduction of Mr. George Davenport's simple arc lamp, coupled with the more extended distribution of electricity, that brought about the change in favour of arc-lamp illumination for optical lanterns. This small regulator ensured a steady light free from flicker, and gave even illumination on the screen of such an intensity that it was not too much in excess of the limelight to be unpleasantly bright. Many modifications of these mechanical regulators are possible, as also are electrically governed regulators, so that any form that will keep the light central after once being adjusted, and that provides for the feeding of the carbons by automatic, mechanical, or electrical means to ensure focus keeping, will be a useful lamp for optical projection.

2. *Resistance.*—As the pressure of the current is too much for a single arc lamp if used exactly as supplied from the electric mains, and, in fact, cannot be used without liability of serious injury to the wiring of house or the electrical plant, it is necessary to place between the supply and each electric lamp something that will stop back or take up some of the electrical energy, and this is called a resistance. It can take the form of water with carbon or other rods immersed in it, and separated little or much, according to the amount of resistance required, or coils of iron wire, or, best of all, a resistance made from wire known as platinoid, which, for the same given length and substance, has a much greater power of stopping back the current than any other available material.

3. A *fuse* should be inserted in the branch or portion of insulated wire that comes from the main wires to the lamp, and is of such a material and thickness that it will melt if the temperature is raised by an excess of current being accidentally allowed to pass through the wires by means of what is known as short circuiting, or from using or attempting to use the full force of the current without resistance, and this is sometimes done by making wrong connexions; but, as the fuse is easily replaced, it does not mean a serious matter. If, however, there were no fuse in what may be called the local wires of the house, then the main fuse, as always provided by electrical companies, would melt, and the whole supply of the building would be cut off, or that portion from which the particular main cable (if more than one were supplied), would be left in darkness. It will, therefore, be necessary for the electrical company to be advised before putting on an

arc lamp, and for their examiner to pass the fittings after completion, as the insulated conducting wire must be of such a thickness as not to get unduly heated, in fact capable of carrying the current, and the fuses must be properly fixed.

4. A *switch* near the lantern will be convenient, and this is provided in some forms of resistances by being attached to it; but, if all connexions with the lantern are made, and the carbons separated *before* the wall plug is inserted to connect up to the current from the main, then it is safe to use the arc lamp without a switch, for the circuit is not completed until the carbons actually touch.

It is a curious fact that, if only a fractional space of air is between the two carbon points before contact, then no light will come, but, the moment they have touched and a spark been produced, the vapour of the arc keeps up the electrical circuit, and the light is maintained, even when the carbons are considerably separated. This brings me to a point that is of great importance in projection apparatus, for in cases of delicate work, where it is necessary to keep perfect centering, a constant feed *must* be maintained, while for general illumination, or for certain photographic work, this is not so important.

Currents.—There are two forms of electrical currents supplied by the electrical companies: one known as the direct or continuous, and the other alternating; in other words, in the former the electric impulses are always in one direction, and the pole known as positive is always so, and that as negative always negative, while with the alternating current the poles are constantly being reversed, many times per second. Both these currents are available for arc light illumination for projection, although, when it can be had, preference should be given to the direct supply, as with such current, in burning, a crater is formed in one carbon which is the chief source of light, and such crater forms a natural reflector, and so enables the whole of the light to be utilised. As, however, there is for all ordinary purposes enough and to spare of light in point of power, it is only a question of having a suitable regulator or lamp, one in which the feeding and centering of the carbon is under perfect control and readily adjustable without removal of the lamp from the lantern. Hand-fed lamps, such as Davenport's, are most convenient for such purposes, automatical lamps being less suitable. With their alternating currents, when an arc lamp is employed, there is always a buzzing sound, but this is not loud or prohibitory if the arc is kept short.

Amount of Light.—The power of the light is practically unlimited, it simply means the amount of current consumed, and this is regulated, if one takes the current as usually supplied at 100 volts, by the size of carbons employed, and the amount of resistance inserted, less resistance being necessary for large currents than for small ones.

With alternating currents, cored carbons are employed for both carbons; but, for direct currents, the negative one should be solid and the positive cored.

5. *Cost.*—The cost of working the arc light for lantern purposes is quite a small item when once the current is brought into the house—in fact, light for light, about one-third that of the limelight; and it is at once apparent, if a little thought be given to the matter, how great is the saving of trouble and anxiety inseparable from the use of compressed gases, &c., when using the limelight. Where the current is only out-

side, and the same is wanted in the house or hall for lantern purpose only, an average of about five pounds will represent the cost of putting it on supply; it will, of course, vary according to the length of wire or insulated cable required, but most owners of property, such as meeting rooms, halls, &c., will probably be easily persuaded to see that it is to their advantage also to have the current on and so agree to pay a share of the cost.

With regard to cost of apparatus, if it is to be purchased outright, for a single lantern it will represent a sum about the same as that for a limelight apparatus where ordinary house gas is available and only one cylinder and regulator (or gas bag and pressure board) are required with a best jet, and, if compared with the high-pressure limelight, will be cheaper, for then two gas cylinders and regulators, or a pair of bags and double pressure board, are required.

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SKIES IN LANTERN SLIDES.

By W. Brooks.

This subject has of late again and again cropped up in the pages of The British Journal of Photography, and as I have been practising the printing-in of skies when required, I venture to give my experience in the matter, which has been considerable. I need not state that for lantern slides and stereoscopic transparencies I only use collodio-bromide emulsion.

For the best result in a lantern slide a fair average negative is required, *i.e.*, a negative that will give a good vigorous print in either silver or platinum, and not one of those miserably thin negatives devoid of contrast that are called quick printers—such negatives are an abomination. Starting with a good negative, at times there are in the sky of the negative indications of clouds that are capable of reproduction in the slide. The slide can either be made by contact or by reproduction in the camera; the plate requires a full exposure, so that it will allow the clouds to be fully rendered. Under these circumstances, possibly the image may be fogged all over. To obtain the result, bring up a fair amount of density; after being fixed (with cyanide of potassium) and washed, it can be cleared by pouring on and off a very weak solution of tincture of iodine, as I have so often described before, followed by the fixing solution; this can be repeated until the desired effect is obtained; the image may have lost a little in density, which can easily be brought up again by the use of pyro and silver. By judicious use of the iodine wash the high lights till cleared, and certain portions of the detail rendered can be lighter by pouring direct on and off at part required; and, again, certain parts can be strengthened at pleasure by pyro and silver, and by this means the image can be modelled up according to the effect required.

We may have a negative devoid of clouds, which, when printed, is nothing but a blank white space, and much is added to enhance the charm of the picture if suitable clouds are put in, and very often the clouds can be chosen so as to help the composition and balance the picture, and very often a slide so treated is the making of a perfect picture. In my own practice, I generally print my clouds in on the same film as the picture, and *not* on the cap glass, by making the two exposures on the same plate and developing altogether, and, should by chance the clouds be a little too strong and obtrusive, they can readily be brought down and reduced by the iodine solution.

The way to proceed is to first make the exposure either by contact or in the camera, having selected the sky negative previously and placed it in a separate printing frame, take the exposed plate and lay it carefully over the part of the negative required, and place in the back board and turn it face upwards; take a piece of card in the right hand and the frame in the left, place the card over, so as to entirely cover the plate, open the dark-room window—which we will presume is facing the north—and, supposing the sky occupies about one-third down the plate, commence to move the card rapidly up and down, never allowing it to rest, or a nasty line will be the result, taking care to give more exposure towards the zenith and *very little* where the sky joins into the landscape, and it will be readily seen to be a system of vignetting the sky into the landscape. After the exposure, the plate is removed and developed, as before stated, and treated in the same way. It must not for a moment be thought that this can be done without practice and skill, as it will be seen that it is a most delicate operation and also requires a great deal of taste and judgment; but, when a perfect result is obtained, it repays for all the trouble.

Another grand effect can be obtained with a subject that has in the foreground an expanse of water, like a mirror full of reflection. If only the sky was printed in, and the mirror surface of the water left blank, something would appear wanting, which can easily be got over and a very effective result obtained. After the sky has been printed in, remove the exposed plate and turn over the cloud negative, and place the exposed plate over the same cloud formations, only this time they are upside down and printed through the negative; that will give the blurred effect that is required, so that the reflections may not be so sharp and defined as the clouds above.

I think those who like to see their work as perfect as possible will feel disposed to give this their careful consideration.

TONING AFTER FIXING.

By P. C. Frewin.

The above title may convey the idea of working backwards, but, if the following instructions are carried out, I am convinced it will in some measure stop the lamentable waste of silver down the public drains; and I think all my readers will agree with me this has increased with the sale of printing-out paper, and, if all the waste were calculated in London alone, it would not be long before some enterprising firm started refining works at the outlet of some of the London sewers.

Since P.O.P. has come into general use, both amateur and professional waste of paper has been far in advance of the average waste of albumenised paper, and one of the most fruitful sources of spoilt prints is contamination with hypo.

Now, on the supposition that we are working largely, if we save every print that is contaminated, at the end of a week we shall have perhaps a few dozen prints. Now, get your hypo bath ready—the same strength as used for fixing after toning, viz., three ounces of hypo to twenty of water—and immerse your prints for ten minutes; after that time, wash them for about two hours. Then get your toning solution ready. Take one grain of gold chloride and make up to an ounce with water, immerse your prints in this for one minute, then transfer them to your ordinary sulphocyanide bath and tone as usual, but judge of the tone by reflected light; when toned, wash for another hour, when prints are ready for mounting.

The above process is simple and certain, and the tones just the same as if the paper were worked in the usual way. I have worked it at all my studios, and have never had a complaint about the permanency of a print.

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LENSES: WHICH TO BUY.

By F. T. Bennett.

Most amateurs commence photography with a cheap set of apparatus, which is usually fitted with a single lens, which, after the first few spoilt plates, due to faulty exposure and development, is condemned as not being a good one; or, it may happen, they have a friend who does good work and uses a rapid rectilinear, or they have heard that the rapid rectilinear is the lens for an amateur, and, as the advertisements say, capable of doing everything. I can only advise the possessor of a single lens not to be in too great a hurry to part with it; for landscapes pure and simple it is perfection, and we have only to look at some of the work done years ago to discover that, with all the modern improvements in lenses, the actual work turned out is, if anything, not so good. A single lens gives a more crisp and brilliant image than a doublet, and, although they are condemned as giving distortion, and therefore of no use when there are any straight lines, if one of a fair length of focus is used—say, seven inch on a quarter-plate—it will want very careful measurement to find any lines out of the true, even close up to the edge of the plate; if there is anything against them, it is, they are not so quick as a rapid rectilinear, though they are now being made to work as fast, and at as large a stop as *f*-8 they give a nice, soft, rounded-up image, suitable for portraiture, and when used at *f*-11 (which is the largest aperture they mostly work at), in conjunction with a fast plate, are quite quick enough for portraiture in any decent light.

There is one great thing in favour of a single lens, and that is the price, which is in most instances, less than half the cost of a doublet. There is one thing I would specially say, and that is, Don't use a *wide*-angle single and expect to get straight lines. The rapid rectilinear, doublet, symmetrical, aplanatic, orthoscope, &c., or whatever you may be pleased to call it, is said to be of universal use, and is no doubt a very desirable thing to possess. They are quick-acting, give straight lines, and can be used for wide-angle work.

The portrait lens was designed for portraiture, and in the designing everything was sacrificed to rapidity. They are also very expensive, if you want a good one, and, after all, not of much use to an amateur, unless he has a studio and has the negatives properly retouched. The lens I consider the best for all-round work is the euryscope, which works at *f*-6 about four times as fast as most singles and twice as fast as the rapid rectilinear. With the modern rapid plates, *f*-6 is fast enough for portraits in an ordinary room. They are symmetrical, and therefore give straight lines; at full aperture they give a soft, rounded-up image, something between that of a portrait lens and a rapid rectilinear; when stopped down, they work like the rapid rectilinear, only giving a slightly softer image, not quite so brilliant; but I find they can be made to work just as crisp by placing over the front and back of the lens a disc of opaque material, so as to cut off the edge of the lens, so that very little light passes through, except that used in forming the image.

Where expense is no object, I should advise the purchase of a lens for each class of work—a single for landscape pure and simple, a rapid rectilinear, narrow and wide-angle, for copying architecture, &c., and a portrait lens for portraiture. Each is best for the special purpose for which it was designed; but where the pocket has to be considered, as an all-round lens, I should most certainly advise the purchase of a euryscope.

THE REPRODUCTION OF PAINTINGS AT HOME AND ABROAD.

By E. W. Foxlee.

It is a matter of great regret, as the British Journal of Photography has more than once remarked in recent articles, to see so much art reproduction sent abroad for execution, while workers at home are complaining of stagnation of trade. There is no denying, however, that it is the case, and that to a greater extent, perhaps, than many surmise. Seeing the existing state of things, it will be well to look at the fact from a common-sense point of view, and inquire the reason or reasons for it; and there must be good ones, otherwise publishers and artists would not risk valuable paintings on long journeys abroad, to say nothing of the cost of carriage, insurance, as well as loss of time, &c., as they do.

One very prevalent idea is that the work is executed cheaper abroad than it is here. That is a fallacy, and the sooner it is dispelled the better, for, as a matter of fact, the prices charged by the best houses in Paris, Berlin, and Munich—and they are the ones that do the most work for this country—are higher considerably than those usually charged here. The reason is not on account of the work being done more expeditiously abroad, for the foreigners are credited with taking an unconscionably long time for the execution of orders, particularly for photogravure plates. As neither cheapness or expedition can be accepted as the reason, we are forced to the conclusion that the results are better than those obtained at home, or, to put it another way, they are more satisfactory to those for whom they are produced. That is the real reason—I am sorry to admit it—and we may as well recognise it at once, and inquire why?

During the past two or three years I have spent several months in Germany amongst art reproduction, photogravure, and the mechanical processes generally, and I must confess that I was surprised at the extreme pains taken, and the time and skill expended upon every stage of the work. In copying, for example, however excellent the negative might be, if there was an idea—even a remote one—that a better was possible, another, and another, was taken so long as any further improvement seemed likely. The same course is followed in every branch of the work. With photogravure—even of very large size—I have seen plate after plate made, not because the work was bad, but simply because it was thought that a better might be possible. When the most perfect plate is secured, it is then placed in the hands of engravers, who have acquired great skill in this class of work, who finish it up to any extent that may be necessary to render it as excellent as possible—*i.e.*, from the publishers' point of view.

I have only instanced photogravure, but the same extreme painstaking pervades all other banches of work; to such an extent is this the case, that one is almost obliged to doubt if 'trouble' finds a place in the German vocabulary. There was one thing that struck me very forcibly in Germany, namely, that the men seemed to take greater pride and interest in their work than is the case with a large proportion of operators in this country.

This jotting is written to dispel the notion that the highest-class art reproduction is 'made in Germany' on account of cheapness, also to stimulate British workers to prevent so much of it going abroad for execution.

THE SWING BACK.

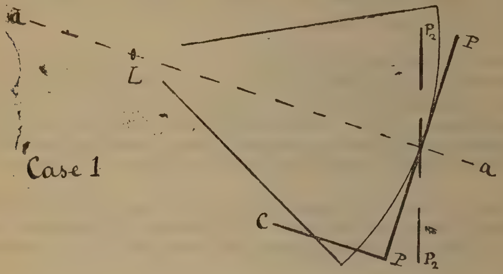
By C. H. Bothamley, F.I.C., F.C.S.

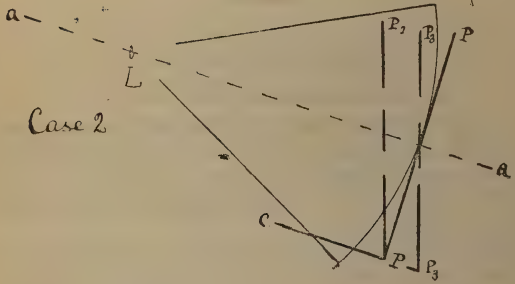
There is probably nothing amongst photographic apparatus about which more uncertainty exists in the minds of new members of the craft than the uses, functions, and effects of the rising front and the swing back. One of the points about the latter that is often debated is the identity or otherwise of the effect of a back that swings from the centre and a back that swings from the bottom.

The attached diagram will make this clear. The camera is supposed to be tilted so that the principal axis of the lens, *a a*, is inclined at a considerable angle with the horizon. The base of the camera will have the direction, CP, and the position of the plate will be PP, the principal axis of the lens passing through the centre of the plate. The curvature of the field of the lens is enormously exaggerated, of course, in order to make the diagram clearer, and it is assumed that the covering power of the lens is sufficient.

In Case 1, the back is supposed to swing from the centre, and when it is brought into operation, the plate will take up the vertical position, P_2 P_2. The axis of the lens still passes through the centre of the plate, but the plate now cuts the field of the lens instead of being tangent to it, and the necessary definition is only obtained by stopping down to a much greater extent than when the swing is not in use, as every one knows. To get average definition on both top and bottom halves of the plate, the back must be racked *in* somewhat; but, nevertheless, the principal axis of the lens will always pass through the centre of the plate.

In Case 2, the back swings from the bottom, and when the plate is brought into the vertical position it will be in the place indicated by the line, P P_2. In order to focus, therefore, it must be racked *out;* and if we suppose it to be racked out to the position, P_3 P_3, corresponding to the position got by simply swinging the back in Case 1, it will be seen that the principal axis of the lens no longer passes through the plate at the centre, but at a point a little above the centre. In practice, in order to get average definition, the plate would not be racked out quite so far as P_3 P_3, but the relations of the axis of the lens to the centre of the plate would be the same.





The practical difference is that when the swing works from the bottom, as in Case 2, there is added to the effect of the swing, *quâ* swing, as in Case 1, the same effect that would be produced if at the same time the camera front were slightly raised. The result is that the definition at the lowest part of the bottom half of the plate may not be quite so good in Case 2 as in Case 1, but the difference would, probably in most cases, be inappreciable.

It may be pointed out that, as a matter of construction, it is easier to get a wide range of vertical swing in both directions when the back swings from the bottom than when it swings from the centre.

THE WET-COLLODION PROCESS.

I.—Introductory.

The fact of the wet-collodion process being now so extensively employed in various departments of photography, more especially in photo-mechanical and lantern-slide processes, and the further fact that we are in constant receipt of letters of inquiry relating to one or other phase of this subject, induces us to reproduce a few articles relating to its chemistry and practice.

The collodion process was introduced through the medium of the *Chemist* in 1851 by Frederick Scott Archer, and seems to have been originally intended by him to produce pellicular negatives—that is, the films after being developed were not primarily intended to remain on the glass plates, but to be removed therefrom and kept between the leaves of a folio when not in use in the printing frame. It was subsequently found by himself and others that the balance of advantages lay in the retention of the films on the glass plates on which they were formed, unless in such cases as necessitated a reversed print. Methods of stripping the film from the plate will be given subsequently. The process was introduced as a negative one, but it was soon discovered that by modifying the developer very fine direct positives could also be obtained in the camera, and it was this that led to the downfall of the Daguerreotype process; for, while collodion positives, when skilfully made, possessed equal, or almost equal, merits with even the finest Daguerreotypes, they could be produced with much greater simplicity, with less expense, and a shorter exposure in the camera, while their permanence is undoubted.

The collodion process is a very simple one, and when care is taken to keep the chemicals in good working order it is a very sensitive one, and one by which negatives of a singular degree of excellence may be obtained. Indeed, the productions by this process have long been held up as standards of excellence to which to attain by gelatine-workers.

The collodion is the first thing to claim attention. Its mechanical property of flowing with oil-like smoothness over a plate of glass—no matter how large—and forming a bright film of uniform thickness, which sets firm in a few seconds, indicated its great advantages as a vehicle for holding the haloid body which, when united with the silver solution, in which it had afterwards to be immersed, formed the sensitive surface.

Collodion, happily, is very easy of preparation, although it will prove more advantageous to purchase it ready-prepared from those who make a speciality of it. It is procurable in various kinds, some better adapted for positives, some for lantern slides, and some giving dense images for negatives and pen-and-ink line work. The quality of the soluble cotton of which the collodion is made has much to do with inducing the various properties named, although the iodising solution also forms an important factor in determining its suitability for special purposes. There is one among the innumerable iodisers that have been proposed which, after many trials of others, we determined upon adopting, and which makes what we would term a good all-round collodion, suitable for every purpose. This we will describe in a succeeding number.

Whether the photographer elects to make his own collodion or not, we should certainly recommend him to purchase his soluble cotton ready-prepared, for, although there is no difficulty in making it, yet is there a certain amount of messiness with it, and this is the more objectionable when it is considered that the messiness arises from very strong acid mixtures. Besides, experienced makers are familiar with the properties induced by varying the specific gravity of the acids employed in conjunction with a variation of temperature, and such experience counts for very much. In what follows, we shall, however, and with a view to making these articles complete, give such directions as will enable any one to make his own pyroxyline without failure.

II.—How to Make Pyroxyline.

Although we have described the making of soluble cotton as a somewhat messy process, we can, nevertheless, recommend that, from an educational point of view, it should be tried. We shall commence by describing a method extensively practised many years ago on account of its simplicity and the good results obtained.

Have in readiness some clean carded cotton-wool, and separate it in tufts, and into a porcelain vessel of suitable capacity, such as a breakfast cup or a bowl, according to the extent of the operations, place a quantity of finely crushed dry nitrate of potash. We always employed the common saltpetre of the shops for this purpose. Now pour in slowly enough sulphuric acid to form a thick solution of the consistence of boiled oil or furniture varnish. A glass rod must be employed for mixing the nitre and acid. The cotton is now immersed in this, tuft by tuft, taking care that each, by the action of the glass rod, is thoroughly submerged and made wet throughout before another is added. Turn the cotton well over to ensure its all being acted upon by the solution. Do not add more cotton than can be easily brought into contact with the liquid. After remaining for from three to four minutes, the cotton, which is now pyroxyline, is lifted by means of two rods or slabs of glass, and transferred to a basin of water, in which it is thoroughly washed in several changes of water. The water is finally wrung out, and the cotton spread out on a towel to dry in a current of air, this being facilitated by pulling asunder the now tangled tufts. When quite dry, it will be found to have considerably increased in weight, For those who prefer to work to scale, the proportions given by Count Montizon may be adopted, which are: one and a half ounce nitrate of potash, ten drachms of sulphuric acid, and forty grains of cotton. We have made pyroxyline by this formula, but always considered that the proportion of sulphuric acid was too small. We have also worked by the proportions given by Ash Haddow, which are: five parts of nitrate of potash, ten parts of sulphuric acid (by weight), and one part of water.

When the mixture is made, it is accompanied by the production of heat, and it is important that the cotton be added before it is allowed to cool, for, as it cools, the mixture becomes quite thick.

The final washing of the cotton should be given with tepid water, to ensure the removal of the bisulphate of potash, for if any traces of this salt be left in the cotton, although, so far as we have found, it does not lessen the sensitiveness of the resultant collodion, yet does it impart a certain degree of opalescence to the collodion film when spread upon glass. This does not interfere with its utility for negatives, but is apt to be detrimental to its employment for positives and lantern transparencies.

When cotton has been prepared as directed, it is not really *gun* cotton, which is prepared in a slightly different manner. It is, however, explosive in a slight measure, and hence, if the drying is completed by spreading it before a fire, exceptional care should be taken that no sparks get near to it.

We believe that almost all the large makers of soluble cotton now do it by the admixture of nitric and sulphuric acids. When these are mixed in nearly equal proportions, and allowed to get cold, the cotton treated by immersiom therein is highly explosive, but very sparingly, if at all, soluble; but, by warming the mixture before immersing the cotton, the solubility is increased, and what photographers desire is, the extreme of solubility without explosive qualities. These properties are imparted by weakening the acids in a slight degree by the cautious addition of water, and raising the temperature to 130° Fahr. previous to the immersion of the cotton.

Haddow the earliest and most exhaustive experimentalist in this direction, availed himself of these facts in order to produce collodion wool by the use of acids, without the trouble of calculating the proper mixture according to their strength. He mixed five parts by measure of sulphuric acid and four of nitric acid (not lower than 1·4 sp. gr.) in an earthenware vessel, and added *small* portions of water at a time, testing after each addition by the immersion of a tiny portion of cotton. This addition of water was continued until a fresh piece of cotton was found to contract and dissolve on immersing. When this took place, half the quantity of sulphuric acid originally used was added, after which as much cotton as could be soaked was immersed for ten minutes, care being taken that the temperature of 130° was maintained. Thorough washing in several changes of water follows, litmus paper being employed to indicate the total removal of the acids. This gives a cotton that dissolves perfectly and instantaneously in ether without leaving a film behind, and the film it produces is of great strength and transparence.

Instead of cotton-wool, filtering paper is preferred by many in the preparation of pyroxyline. It is certainly easy to manipulate, but beyond this it does not appear to possess any special advantage. Linen, too, has by some been strongly recommended. For this we have this good word to say—that, when dissolved in ether, it gave the strongest and toughest film we have seen.

It is impossible to say from an examination of the collodions of commerce whether they are prepared from wool, paper, or linen, as information of this nature is not usually given to the world by the respective manufacturers.

III.—Dissolving the Pyroxyline and Iodising the Collodion.

In connexion with the making of pyroxyline we have been asked to give a formula for mixing the acids for the preparation of soluble cotton which will not necessitate the tentative method of Mr. Haddow, described in the previous article on this subject. Take equal parts of sulphuric acid of sp. gr. =1·836, and nitric acid sp. gr.=1·40, and, having mixed them, immerse the cotton as directed in the other cases. It is of consequence that the acids be of the strength indicated.

Collodion is commonly supposed to be a solution of 'gun-cotton' in sulphuric ether. This, however, applies to the collodion of pre-photographic times. We now know that 'gun-cotton' is not necessarily suitable for photographic purposes, nor is ether alone the most suitable solvent for the cotton.

What is the best solvent for pyroxyline? It will dissolve, if well prepared, in alcohol alone, and in rectified pyroxylic spirit (wood naphtha); but by far the best solvent and the one giving a smooth flowing and homogeneous film is an admixture of sulphuric ether and alcohol in nearly equal proportions, with a preponderance in favour of the ether.

Let us here pause for a moment to say that the alcohol of ordinary commerce, whether rectified or methylated, is too weak for getting the high-class collodion from its use. It should be strengthened by the subtraction of some of the water present. As it is considered illegal to treat methylated spirit of wine with a view to the making of it 'absolute,' we conform to the laws, more especially as absolute alcohol is not necessary to the making of collodion, at any rate we have never found it to be so. But we can fall a little short of this, and still be within the permission of the law, while at the same time we shall obtain it of a strength quite sufficient for our purpose.

Get a quantity of carbonate of potash, crush it to a fine powder and dry it in any convenient way, such as by placing it in a clean shovel and holding it over a clear fire for a short time. To the alcohol about to be strengthened, and which is now supposed to be in a clear bottle, add a handful of this and shake up well for a few minutes. Here is what takes place. The carbonate of potash is soluble in water, but is not so in alcohol. In course of a few minutes, all the undissolved potash salt sinks to the bottom of the bottle, and is covered by a supernatant solution of carbonate of potash solution in water, the water having been abstracted from the alcohol. The alcohol remaining as a supernatant fluid is stronger than it was by the abstraction of the water, which, as a solvent of the potash, now being much heavier, floats below. It only remains to carefully decant the spirit, which, if tested, is now very strong, its water having been abstracted.

This is quite strong enough for every purpose required in the making of collodion. If methylated spirit is wanted to be any stronger, it may be made so by distilling it from lime; but this, we understand, is illegal. Hence we do not advise it, especially as it is not necessary.

The way that we have found to be the most convenient for effecting the separation of the spirit from the potash solution is to have a clear bottle, like a brandy bottle, and with a graver or any hard steel point to drill a small hole as near to the bottom as possible. This will easily be done by using turpentine as a lubricant. Plug up the hole with a splinter of wood, and then nearly fill the bottle with the spirit that is to be operated upon. When the water has united with the potash, it can be removed from the alcohol by withdrawing the wooden plug and allowing it to run off.

Some samples of pyroxyline that will not dissolve perfectly in ethe do so very readily in a mixture of about four parts of alcohol and six parts of ether. Place eighty grains of the cotton in a sixteen-ounce bottle, and pour over it four ounces of alcohol, afterwards adding six ounces of ether. Cork the bottle and give it a good shake, by which every particle of the cotton should be dissolved. Some have imagined that the collodion is improved by the addition of three or four drops of chloroform to each ounce. We have made some with and some without this addition, and have found no difference between them. Label the bottle 'Plain Collodion,' and store it away for use as required. It will improve with age, and become as limpid-looking as distilled water.

The iodising of the collodion next claims attention. It is probable that no two makers adopt precisely the same compounds for doing this. Some use iodide of potassium, others that of ammonium, others prefer cadmium, or zinc, while the majority find that a judicious mixture of two or more confer advantages not belonging to either of them singly.

So little as two grains of iodide of ammonium, previously dissolved in alcohol, and used for the ounce of collodion, have been known to give excellent results for positives; but for this the plain collodion, which contains eight grains of pyroxyline, would prove too rich, and would have to be diluted fifty per cent. before being iodised. But, along with the iodide, it is found to be much better, for both positives and negatives, that a certain proportion of the bromides be also present. The bromide of potassium is so very insoluble in ether and alcohol that it is better to avoid it altogether in favour of others which are soluble in that menstruum. The cadmium haloids possess the advantage of conferring great stability upon collodion, and we have known a cadmium bromo-iodised collodion remaining quite colourless for many months after being mixed.

For many years we have given preference to an ammonium and cadmium collodion prepared as below, and have found it to answer *every* purpose, being highly sensitive, possessing good fluent properties, and remaining stable for a long period.

Dissolve :—

Iodide of cadmium	65	grains.
Iodide of ammonium	25	,,
Bromide of cadmium	19	,,
Bromide of ammonium	11	,,
Alcohol	5	ounces.

This dissolves easily, and is added to fifteen ounces of pure collodion.

IV.—The Silver Bath.

This has always formed the *bête noir* of the operator in collodion, and yet it need not be so. A clever photographer who puts himself to the trouble of acquiring a knowledge of its principles of action is rarely troubled by its getting out of order, or at any loss to correct it if it does.

The formation of the silver bath is one of the simplest feats known in chemistry. It suffices to dissolve nitrate of silver in distilled water in the proportion of from thirty to forty grains of the salt to each ounce of water. If a lightly iodised collodion is employed, then will a thirty-grain bath prove amply sufficient; but for such a bromo-iodised collodion as that for which we gave a formula in the last chapter we would advise a thirty-five grain bath, the reason being that, the greater the quantity of bromide in the collodion, the stronger should the bath be. As soon as the nitrate of silver has dissolved, the bath is ready for use, subject to one thing.

When in solution, silver nitrate has the property of dissolving silver iodide to a small extent; and it is desirable, previously to commencing work, that this tendency be overcome by saturating it with the iodide. We have known some of the most whimsical schemes conceivable proposed for effecting this simple end; but the readiest, and one which cannot possibly fail, is this:—

Procure a glass vertical dipping bath with a glass dipper, and fill it four-fifths full with the silver solution; now collodionise a levelled plate of glass by pouring a small pool of collodion in the centre, and, gently tilting it to make it flow evenly from corner to corner, drain the surplus back into the bottle, place it on the dipper, and lower it into the bath. It immediately acquires a yellow opalescence, which is at its maximum after the plate has been in the silver bath for about two minutes. At this stage it could be placed in the dark slide and impressed with an image in the camera, but this is not our intention just at present. By allowing the plate to remain in the solution for a few hours, but not less than half an hour at any rate, the bath, which first formed the iodide, is found to have redissolved much of it, and the plate, so recently opalescent, is now nearly clear again, probably in patches, from the nitrate bath having eaten up its own offspring. It only does this once; hence, after this has taken place, the preparation of the nitrate bath is completed.

Another method of iodising the bath consists in dissolving the silver in about one half the water decided upon, and to this adding a few drops of a strong solution of iodide of potassium. This will immediately cause a formation of iodide of silver that, by shaking, will be redissolved by the strong nitrate solution. The remainder of the water is then added, by which the surplus iodide will be precipitated, for the weaker the silver solution the less iodide is it capable of holding in solution. After having been filtered, the bath is ready for use.

The bath is usually considered to be in the best condition for working when, on being tested with litmus paper, it is found to have a slightly acid reaction. If the litmus remains unchanged, which will be the case if the silver solution is alkaline or neutral, nitric acid diluted with distilled water must be cautiously added until the litmus paper becomes reddened.

To coat a plate with collodion hold it level, either by finger and thumb at one corner if it be a small one, or on a pneumatic holder if large. The collodion must be poured on the centre and made to flow to each corner. This can be done with readiness and certainty if the operator remains quite cool and avoids getting flurried. It is best done when the collodion is in a moderately wide-mouthed bottle with a turnover lip; a wide mouth also facilitates the draining back from the plate of the surplus collodion. The film sets rapidly, and when, by touching with the point of the finger, this is found to be the case, the plate is placed upon the dipper and immersed in the silver bath by a steady, unbroken downward motion. If a halt be made when immersing it, this will show in the finished negative as a line across the plate. After remaining in the bath for about two minutes, the plate should be lifted up to see if there are any greasy-looking markings on the surface of the collodion. If so, reimmerse it and give a few movements sideways. This will effect the removal of these ether marks, and ensure the equal union of the silver bath with the non-sensitive surface.

A flat porcelain or glass dish will answer as well as a vertical bath for sensitising the plate. In this case the plate must be raised for examination by a hook made of silver wire or vulcanite. Avoid the use of the fingers, gutta percha, or a hook made of base metal for this purpose, for the first will ensure their being badly stained, the second may introduce organic matter in the bath, and the third will cause a precipitation of silver. Baths of gutta percha were much used at one time, but we strongly urge the avoidance of this, for, sooner or later, it will exercise a deleterious influence upon the silver solution, and cause the plates to fog, even although it has been previously rinsed out with nitric acid, and even coated with varnish afterwards. Gutta-percha baths are greatly to blame for many difficulties encountered by amateurs in practising wet collodion.

After draining the plate for a few seconds, it is ready for exposure in the camera. It is somewhat difficult to convey an idea of its sensitiveness. Although much less sensitive than gelatine dry plates, it is sufficiently so for obtaining full exposures by a drop shutter on a bright summer day, if the lens is not stopped down.

V.—Development of Negatives.

When Archer introduced the wet-collodion process, the developer he associated with its use was pyrogallic acid, but not as it is now employed with dry plates. A three-grain solution of gallic acid had hitherto been the developer for the Talbotype and albumen negative processes, and an admixture of an acid, such as acetic, with it, to a considerable extent was necessary. The development was slow, and a long exposure was required. The first step in the revolutionary direction of shortening of both exposure and development was taken by the joint introduction of collodion and pyrogallic acid, or pyrogallol, as it is with greater propriety sometimes designated. The original developer was composed as follows:—

Pyrogallic acid	2 grains.
Glacial acetic acid	½ drachm.
Water	1 ounce.

This was poured upon the plate, and, mixing with the silver thereon, developed the latent image. With this developer the silver bath was kept in a condition nearly bordering upon neutrality. The image was fixed by hyposulphite of soda. On looking over an album of photographs taken by the foremost men of that period, we find that, as regards quality, they quite equal those of a similar class of subject done at the present time. The album alluded to is a large bound volume, designated *The Photographic Album for* 1855, among the artists' names being those of Francis Bedford, O. G. Rejlander, Count Montizon, Dr. Percy, Lake Price, Dr. Diamond, Delamotte, Shadbolt, Rosling, Howlett, Hennah, Pollock, Stokes, and others, in all forty-four.

The dimensions of the photographs vary from whole-plate to 12 × 10, and, while some are taken by the Calotype or Talbotype process, the greater number are by wet collodion. The comparative rapidity of the two processes is noteworthy. Henry Taylor's charming *Sheltered Nook*, by the former, was developed by aceto-nitrate of silver and gallic acid, after an exposure of five minutes with a landscape lens of twelve inches focus, and a diaphragm eleven-sixteenths of an inch; while those on collodion required a much shorter exposure, *e.g.*, Count de Montizon's *Hippopotamus at the Zoological Gardens*, taken with a quick lens, is recorded as taken instantaneously. This magnificent album forms a valuable connecting link between the paper and the collodion era, especially as full details of process, lens, exposure, and development are given on the facing page of each picture.

By the adoption of the ferrous-sulphate developer the time of exposure with lenses of average rapidity is considerably reduced, and numerous instantaneous views of street scenes, breaking waves, persons taken in mid air while jumping, with others of like nature, are still to be met with. A good formula for an iron developer for negatives is :—

Protosulphate of iron	¼ ounce.
Acetic acid	1 ,,
Alcohol	½ ,,
Water	8 ounces.

A sufficient quantity of this is applied by being poured along one of the margins, and allowing it to flow over the surface. This is ensured by the alcohol. A solution of iron alone will develop the image, but the acetic acid conduces to cleanliness, while, as stated, the alcohol causes it to flow over the surface with oily smoothness. This must not be poured off, but retained on the surface of the place. In a very brief period the image will appear, faintly at first, but gradually acquiring density. If the development be arrested before the full vigour has been attained, the picture will, if backed with a black material after fixing, be a positive, to the production of which class of image we shall devote a special chapter; but, our object being the production of a negative, the developer must be allowed to remain on until it ceases to impart further intensity. It is then washed off.

Density, should the image be too thin, can be imparted by a variety of methods, such as the application of a fresh quantity of the developer, to which a few drops of silver solution have been added. A popular intensifier consists in pouring over the thin image a three-grain per ounce pyrogallic acid solution, in which has been dissolved two grains of citric acid, and an addition made to it of a few drops of silver from the bath. This rarely fails to impart great intensity to the image, and, when attained, the negative is fixed in a solution of hyposulphite of soda or cyanide of potassium, the former being preferred for negatives and the latter for positives.

It may happen that, for certain special purposes, such as copying line subjects for engraving, a still greater degree of density is desirable. This may be attained by either of the following means: immerse, after fixing and washing, in a solution of bichloride of mercury until the image is white throughout; wash well, and then immerse in a two or three-grain solution of cyanide of potassium, which has been nearly saturated with silver. There is a tendency in the photographer to leave it too long in the mercury solution, in order to ensure the greatest possible intensity being obtained, but this has the effect of causing a deposit on the clear lines of the drawing or engraving (the class of subject at present in our mind's eye), which interferes with the vigour of the negative. Now, it happens, as discovered by Carey Lea, that the cyanide in this system of intensifying exercises a twofold action: it denudes the lines of every particle of deposit, leaving them clear and transparent; while at the same time it blackens and confers great density upon the portions representing the whites, the mercurial deposit being different in each.

Another way is to form a bromide of copper solution by dissolving equal parts, or, more correctly, combining proportions of sulphate of copper and bromide of potassium, and applying to the negative. Follow this, after washing, with an application of a solution of nitrate of silver, which will immediately cause a great blackening of the image.

Neither of these two methods is advisable for intensifying portrait negatives, as they are apt to give a too great degree of opacity. For portraiture, a better intensifier consists in a rather weak solution of sulphide of potassium, which is poured over the surface of the negative, and allowed to remain there until the colour of the image is seen to have become darkened, which may occupy from twenty to fifty seconds, according to the strength of the solution.

After being washed and varnished, the negative is now ready for being printed from.

Before dismissing the subject of negative developers, it is proper to say that it was found by Lea, in 1865, that organic matter, combined with an iron developer, united the advantages of iron and pyrogallic acid—the delicacy and detail of the one and the force of the other. One way amongst others suggested for its preparation consists in adding one ounce of sulphuric acid to three ounces of water, and, when cool, dissolving in it an ounce of gelatine, the liquid being kept slightly warm for twenty-four hours. Iron fillings or turnings are added without heating, and allowed to stand for several days. Before filtering, and to make sure that no free sulphuric acid shall be present, throw in half a drachm of acetate of soda, then fifter and dilute to fifteen ounces. As stated, this developer combines the advantages of both pyrogallic acid and iron, and does not cause fogging by the image even when left on the plate for a long time.

VI.—Collodion Positives.

Unlike other processes, the image on a collodionised surface is, when viewed by reflected light, of a light colour. Hence, in the very earliest days of the process, the possibility of making positives in contradistinction to negatives was recognised. A picture of this class is negative when looked through, positive when looked upon. It is true that, as a negative, the image is thin and feeble, owing to the development being checked at an early stage; still, the image partakes of the negative character.

A very excellent way by which to illustrate the positive and negative distinction is to clip out a piece of tinfoil in any fancied shape—a star, for example—and paste it down upon the centre of a clean plate of glass. This affords an efficient demonstration of negative and positive, being the former when looked through, and the latter when looked upon. Attention having been paid to the conditions requisite to obtain positives of fine gradation and good colour, and which competed in these respects with the Daguerreotype, this latter, in an incredibly brief period, gave way before its potent rival, and ceased to be practised.

When the most ordinary precautions are taken to ensure permanence, a collodion positive never fades. We possess many that were taken within one or two years after the introduction of collodion, and they show no indication of fading, although more than forty years have elapsed since they were taken. What we mean by 'ordinary precautions' will be explained as we proceed.

A collodion that gives a strong dense negative is not the best for positives. Here we want delicate thin gradation rather than vigour, the requirement being such thinness of the image as, except in the very highest lights, shall be influenced by any suitable black matter being placed behind or in contact with the plate. Such a collodion as that for which we gave a formula will answer well, provided it be considerably thinned by the addition of sulphuric ether. An immersion in the nitrate bath of two minutes usually suffices for sensitising, and with a thinly salted collodion the bath need not exceed thirty grains to the ounce at the commencement, although, singularly enough, it will frequently work well when the silver has been so far exhausted as to show only eighteen grains, although by making a bath of an initial strength of eighteen grains we have failed in obtaining good results. How far the presence of the products of decomposition tends to this end, or the probable manner in which they act, are questions not necessary to be here discussed.

Iron gives a whiter image than pyrogallol, therefore it must be the developer for positives. While it is quite true that pyrogallol, one grain to the ounce, with two drachms of acetic acid, and one drop of nitric acid, has been recommended, it is less advantageous than iron in nearly every respect. While a developer giving moderately good pictures may be formed of a solution of protosulphate alone, yet will the addition of about two drops of nitric acid per ounce considerably improve the colour. Still better is the nitrate of iron. First suggested by Diamond, it was prepared, according to Ackland's treatise on the positive collodion process, by decomposing the protosulphate of iron with nitrate of barytes, and removing the sulphate of barytes which is precipitated. The formula stands thus:—

Protosulphate of iron	2 drachms.
Nitrate of barytes	1½ ,,
Acetic acid	2 ,,
Alcohol	3 ,,
Water	10 ounces.

The iron and barytes are dissolved each in one half of the water, then added to each other, after which it is decanted and filtered, and the acetic acid and alcohol then added, when it is ready for use.

It will readily be perceived that other nitrates, such as that of lead, which form insoluble sulphates, will answer instead of that of barytes.

A modification of this, for which photographers were indebted to Mr. John Spiller, saves all the trouble of decanting and filtration, inasmuch as it gives a clear solution at once. It is this:—

Protosulphate of iron	14 grains.
Nitrate of potash	10 ,,
Acetic acid	½ drachm.
Nitric acid	2 drops.
Water	1 ounce.

The decomposition produces protonitrate of iron and sulphate of potash, which are both soluble in water, the presence of the sulphate of potash not interfering with the developing.

If asked which of these developers we prefer, we unhesitatingly point to the latter, which we have used many hundreds of times.

In any case the development should be stopped by rinsing with water as soon as the details become visible.

To fix, cyanide of potassium should be employed in preference to hyposulphite of soda. The precise strength is not of vital consequence. Anything from five to ten grains per ounce will do, but it is to be remembered that, if strong, the fixing solution will quickly dissolve away the more delicate shades of the image. This is not an unmixed evil, for, when by over-exposure or over-development a too flat picture results, a considerable degree of vigour may be imparted by allowing the solvent action of the cyanide to act upon it and reduce the weaker portions to any desired extent, the lights remaining longer unaffected.

After the fixing has been completed, it will, in most cases, tend to impart greater whiteness to the silver deposit if a rather strong and old cyanide solution be poured over the surface and allowed to act for from two to four seconds.

The washing of the picture occupies a very brief time compared with that required to remove hyposulphite from a gelatine plate. The cyanide is removed from a wet-collodion plate by allowing the water from the tap to play upon the surface for one minute, after which the plate is dried by holding it before a clear fire.

If the bright deposit of silver be too metallic, owing to too great a proportion of nitric acid being in the developer, this may be remedied by adding more acetic acid; while, on the contrary, if it is of a too dead or chalky white, one or more drops of nitric acid will give the metallic lustre.

When sulphuric acid is added in liberal proportion to the iron developer, the image will possess an appearance as if composed mainly of tinfoil. This may prove useful when making a positive of an object composed of metal, but, in our estimation, it does not look well in the case of a portrait.

VII.—Alabastrine Positives.

Almost simultaneously with the discovery of the collodion process Archer made the further discovery that the silver image could be rendered white by being treated with a solution of bichloride of mercury. This, having been followed up, culminated in the alabastrine process.

The name itself is pretty and suggestive of the nature of the photograph. Still, when well made, the picture exceeds in the pearliness and purity of its tones, the finest alabaster possible to be obtained; indeed, there is an inexpressible charm about an alabastrine positive, added to which is the pleasing fact that it is one of the most permanent of the numerous fraternity of the photographic family. As above hinted, the basis of the alabastrine photograph is a collodion positive; but, in order to obtain the best effect, the whites must consist of a denser deposit of silver than is requisite for an ordinary positive.

A developer that has been recommended for this class of picture consists of a mixture of solutions of pyrogallic acid and protosulphate of iron, nitric acid being present; for, as every chemist knows, if this latter acid were omitted, the mixture of the pyrogallic acid and iron would form a solution as black as ink, to which, indeed, it would be closely allied. We do not say that such a developer is necessary in all cases, for we have obtained many admirable results with a plain iron developer.

A suitable formula consists of the following :—

Protosulphate of iron	15 grains.
Pyrogallic acid	3 ,,
Nitric acid	3 or more drops.
Water	1 ounce.

If the solution be black from the formation of gallate of iron, one or two drops of nitric acid more must be added.

The bleaching solution consists of—

Hydrochloric acid	4 drachms.
Nitric acid	4 ,,
Bichloride of mercury	*quant. suff.*
Alcohol	4 drachms.
Water, distilled	6 ounces.

It is the best to omit adding the two last until the acid mixture has dissolved all the mercury which it is capable of doing.

The plate, having been fixed and well washed, is placed on a levelling stand, and enough of the above to cover the surface is poured upon it. At first the picture will, in some cases be darkened, even to disappearance by reflected light, but it will gradually lighten up, until eventually it acquires a colour of a character quite different from what it originally possessed, having now a pearly-white appearance. This may take from five to thirty minutes, according to temperature, &c.

It might reasonably be thought that the nitric acid present would have a solvent action on the image, but it has scarcely had time (even when present in a much larger proportion) to act ere the mercury has also acted and counteracted this tendency.

In washing the picture distilled water ought to be used. If there is any alkali present in the water, the purity of the whites will be degraded. Fortunately, little washing suffices, as the film is now in a very spongy condition. The purity of the whites is improved when dry.

Instead of the bleaching formula we have given, another containing protosulphate of iron was at one time recommended; but, having made comparative trials of both, we give preference to that given above. The following is the one in question:—

Bichloride of mercury	80 grains.
Protosulphate of iron	40 ,,
Chloride of sodium	30 ,,
Water	4 ounces.

In our estimation, alabastrine pictures ought not to be varnished, at any rate as the term is usually employed. We have said that the image is of a spongy nature, and any varnish which is applied should be so thin as to be absorbed by the whites, leaving a glaze on the blacks. After having tried every preparation sold or suggested when these pictures were fashionable, and when recipes for the preparations required in their productions were privately sold at a high price—a guinea for any one being the usual charge—we came to the conclusion, after numerous experiments that the best effect was obtained by the application of a varnish, if such it could be called, composed of spirits of turpentine, holding in solution such a modicum of Canada balsam as when spread upon glass formed a film of extreme attenuation. This is seemingly quite absorbed by the image, which remains matt as before, but it is apparent in the blacks, to which it imparts additional lustre.

This application also permits of the image taking on colours to any desired degree of depth, the colours referred to being those in powders, so well known and so extensively used in Daguerreotyping and subsequent times. The surface, without this preparation, takes the colours quite with it a greater depth is possible.

Owing to the peculiar texture of the collodion, the colours may, by the application of a stronger varnish than the above, be caused to penetrate the body of the image, and become equally visible from either side.

If a picture thus taken be mounted in a morocco case, with a piece of black velvet behind and a colourless glass in front, it will vie in beauty with the finest productions of the ivory-miniature painter, while, as regards permanence, it will remain absolutely unchanged.

VIII.—Failures arising from the Bath.

One would imagine that, the composition of the nitrate of silver bath being so simple as we have described it to be, it could not readily get into disorder. Yet there are few indeed who have not had their run of success abruptly interfered with by a fit of perversity in the bath.

The visible tokens of this displayed in the pictures are fogginess, streaks in the direction of the dip, pinholes, thinness of, and want of contrast in, the negatives, &c. Old-time photographers know all about troubles of this nature, and we may here say that the providing of a remedy for any one or more of these diseases forms an admirable object lesson to the photographer, however much he might dislike to be compelled to adopt remedial measures in the midst of his business. A wise photographer, however, would keep two baths, one of them always in good condition, with which to relieve the other when it was deemed to be necessary to retire temporarily from active service.

It may be taken for granted that a bath, in as neutral a condition as will give clean images, is the most sensitive of all. The most sensitive one of which we have any cognisance was made of fused nitrate of silver (lunar caustic), the fusion of which had been carried to a farther stage than at first intended, by which it was believed that a modicum of silver nitrite had been formed. This permitted of drop-shutter exposures being given on a day that was by no means bright; but, as it had been placed in a new gutta-percha bath-holder, it became contaminated with organic matter from that source. Organic matter in the bath is the source of most of the evils to which it is liable. It is not easy to say with definiteness how it gets there. We have known it to arise from making the bath with distilled water obtained as waste from a steam engine, oil vapours in this case being supposed to have been present; the ether and alcohol from the frequent immersion of a collodionised plate also leave organic matter behind them.

Slight fogginess will often be cured by the addition of tincture of iodine to the collodion, or a small crystal of iodine, which immediately dissolves. The addition of nitric acid to the bath will also, in many cases, cure fog. The way by which it is to be used is to dilute a drachm of the acid with an ounce of distilled water, and of this add not more than two or three drops at a time to the bath, making trials after each addition.

We have already spoken of gutta-percha baths as inducing fogging. This may, in a great measure, be obviated if the vessel be washed well out at first with water acidulated with nitric acid, followed by pure water, and then be given a thick coating of shellac varnish.

A beginner may, after a time, experience streaks on his plates. These occur under various circumstances. If the plate be immersed in the bath before the ether has had time to evaporate, its displacement by the water has a tendency to be accompanied by greasy-like vertical lines. A preventive of this is found in not immersing the plate too soon after coating, and in giving a slight motion sideways to the plate after it is in the bath. It is well also to give an up-and-down motion to the plate, which should never be placed in the dark slide so long as any such streaky markings appear on the surface.

Pinholes are caused, mechanically, by particles of dirt floating in the silver bath, and, chemically, by super-saturation with nitro-iodide of silver. This latter is the most fertile source of pinholes.

In the former chapter we said that iodide of silver was soluble in nitrate solution, and that it was soluble in proportion to the strength of the latter. All the time the bath was in use it was gradually getting weaker in silver and stronger in iodide. What is now required is to de-iodise it to a great extent. This is done by adding a quantity of distilled water, which, by weaking the strength of the solution, causes a precipitation of silver iodide, which must be removed by filtration. Crystals of silver nitrate are then added to bring up the strength of the bath to what it originally was.

A bath that fogs from the presence of organic matter may be cured by rendering it neutral by means of ammonia or sodium carbonate, and exposing it to sunlight for a day. This is most effectively done by pouring it into a flat porcelain dish and setting it out in a place free from dust. Filtration must follow this treatment.

When the bath has become heavily charged with ether and alcohol, which are abstracted from the collodionised plates immersed, these impurities may, in large measure, be got rid of by pouring the solution in a porcelain or German glass beaker, and applying heat from a carefully regulated Bünsen gas stove. This treatment, coupled with an after-exposure to the sun, will rarely fail in bringing into good working order the most hopelessly bad bath conceivable.

Especially valuable as an agent in curing badly working baths of numerous ailments is the addition of a few drops of a solution of cyanide of potassium. The chemical action of this has never been satisfactorily explained, but the fact is as stated. It has been found that silver baths which had been sunned for many hours, and still refused to be decolourised, succumbed at once upon an addition of a very few drops of cyanide solution, a gratifying fact being that the pictures obtained subsequently were of a much higher class than those originally got by the same bath.

Markings of a shape akin to oyster shells are sometimes met with. They are often so superficial as to be removable by the application of a tuft of cotton-wool or a camel's-hair brush after drying, or by the point of the tongue while the plate is still wet. These are, in the main, produced by the contact of the silver solution with the wood of the dark slide and its back-flow over the surface. Wipe the back of the plate before placing it in the slide, and, if the rebate is not protected at the corners by glass or by silver wires, insert a slip of blotting-paper to cut off direct contact with the wood, and, in all probability, such markings will henceforth be conspicuous by their absence.

IX.—Collodion Transfers and Photo-crayons.

Any articles on the wet-collodion process would be sadly incomplete were we to omit all reference to collodion transfers and photo-crayons, seeing that by no other means can they be effectively made. While it is quite true that this class of work has, for a few years past, been to a large extent superseded by other means of producing enlargements, we have the best means of knowing that both are still being employed, and are productive of considerable emoluments to those who work them.

In either case, the first requisite is a thin collodion transparency of any desired degree of enlargement. In both, it is necessary that a collodion be used which shall give a film that when dry is quite transparent and free from opalescence, at any rate from such milkiness or opalescence as resists the clearing influences of a subsequent coating of varnish. It is also necessary that the character of the chemicals employed is such as to give transparence in the shadows. This is easily ascertained by making a transparency, no matter how small, and when dry laying it face down on a white sheet of paper and pressing in contact therewith. If the shadows are too dark and heavy, it indicates that the development has been carried too far, or that the collodion is too rich in the sense of being too heavily iodised.

At this stage of our remarks, which apply to both transfers and photo-crayons, it is better that we now treat them singly.

Soon after the Princess of Wales came to this country Disderi took a negative of this esteemed lady, *cartes* from which soon found their way to the public, and so great was the demand for these that it was impossible to print them by ordinary means in quantities sufficient to keep pace with the requirement. Very soon, however, there was an issue of them of a type differing from the ordinary class of silver prints. They were very delicate, yet vigorous, of an engraving-black tone, and on enamel paper. Responding to an invitation, we visited Disderi's *atelier* at Kensington, and witnessed the production of these and of other members of royal families of Europe, for which he acquired great fame. They were all collodion transfers, and were produced in the following way:— At one end of a copying camera was inserted a negative, at the other end being the dark slide capable of containing a plate of large dimensions, and also capable of being subjected to a series of shifts, both from top to bottom, and from one side to the other. Each shift brought the sensitive plate in front of a square, or rather oblong, aperture, in which was focussed the picture to be printed. Between the negative and the sensitive plate the lens was inserted. The camera was directed upwards to the sky, and to position No. 1 was given an exposure of, say, four or five seconds, according to light. Then a shift of the sliding back was made to position

No. 2, followed by a similar exposure, and so on until the twelve or twenty-four (as the case might be) positions were secured.

The images were then developed at one operation by proto-sulphate of iron containing a liberal proportion of acetic acid. After being fixed, they were toned by means of a wash of bichloride of mercury, by which the image was darkened. The collodion film was then well washed, which, it need scarcely be said, occupies a mere modicum of time compared with that required for a gelatine film. While still wet, a sheet of enamelled paper was laid upon the plate, a squeegee passed over its back to ensure contact, and, without waiting till it became dry, the paper was immediately stripped from the glass plate, carrying with it the one or two dozen pictures thereon.

By means of a punching machine the pictures were cut out of the sheet and then mounted without other preparation. In this way were printed hundreds of thousands of pictures, a singular fact being that, notwithstanding the summary and quick treatment to which they were subjected throughout, many of those prints have proved *more permanent* than others printed at the same time on albumenised paper and toned by gold in the most approved method.

Let it be well understood that the mercury treatment must be carried no farther than the blackening of the silver deposit which formed the image, no after-application of ammonia or other alkali being made.

The method here described, which we have condensed from notes made on the occasion of the visit referred to, ought to prove of great value to professional photographers, who are often sadly troubled as to getting orders executed during the prevalence of weather hostile, from its darkness, to printing. M. Disderi, at that time the *bon-ton* photographer, not alone of Paris and London, but of Europe, made no difficulty about permitting his method of printing to be published, and photographers at the present day ought not to be too conservative to avail themselves of his methods. The one objection which might have been urged against these transfers at the time of their introduction, viz., the fear that the British public might object to tones other than the time-honoured photographic purple, now no longer exists, thanks to the educating influences of platina and bromide. On comparing a Disderi print made in our presence by the method just described with one of the most recently produced platina prints, we find a wondrous degree of similarity in their tone.

If negative collodion is about to be made use of in the production of transfers, it should be of a tough, horny character, and rather thicker than what is required for small negative work, It should also contain a large proportion of bromide, and, as previously stated, it should give a thin and rather feeble image. This it will in all probability do if about one-fourth its bulk of plain uniodised collodion be added to it.

Large transfers, intended to be painted in oil colours, as those so long associated with club work, are made rather differently from the Disderi method described.

These prints are usually enlarged from small negatives, and may be made either by a limelight lantern or by directing the camera to the sky. If brevity of time of exposure is an object, the development may be done by iron, a strong solution being preferred, but held in check by gelatine and citric acid, this last determining the tone, for without it the print would be too grey and feeble by reflected light. But the finest-looking pictures are produced by pyrogallol, the following formula being one that can be well recommended for the purpose :—

Pyrogallic acid	100 grains.
Citric acid	60 ,,
Acetic acid	2 ounces.
Water	20 ,,

The tone given by this is dark yet warm-coloured, and is such as not to necessitate any after-toning. The finest tones are obtained when this developer is used within a week of its preparation. After fixing, for which hyposulphite of soda must imperatively be employed, and washing, the picture, it is not allowed to dry, but is covered with a sheet of wet transfer paper, which is squeegeed in contact, and the whole reared up to dry, which it will do in the course of a night. Next morning it is stripped from off the glass plate, and is found with an extremely glossy surface, favourable for the application of oil colours. If it is not to be thus painted, a more matt surface is better, and this is obtained, either by stripping off the paper before it is allowed to dry, or, if dry, by steeping in water.

The transfer paper is easily made, and each photographer can prepare it for himself—a large quantity at a time, for it keeps for an indefinite period. Any good paper is floated upon gelatine prepared thus :—Place four ounces of gelatine in a quart of water, and allow to soak for half an hour, then warm the vessel by placing it in a second one containing hot water. The gelatine will now become liquefied, when four grains of chrome alum, previously dissolved in hot water, are added. This is poured into a flat dish, and retained in a fluid state by the application of gentle heat. The paper is coated by being floated upon this, and a quantity should be done at a time, for the paper will keep, but the gelatine will not.

When this transfer paper is about to be used, it must be soaked in cold water for a few minutes, when the coated surface will have a slimy feeling. It is then laid face down upon the picture as already described.

Concerning photo-crayons little need be said. A thin transparency produced as scribed is dried upon the glass, and is backed with paper of any desired colour or texture. The specific name is derived from its productions being vignettes, and the backing paper having penci hatching, *à la* crayon, merging into the photograph.

X.—Ascertaining the Strength of Silver Solutions.

It is often of the greatest importance that the strength of silver solutions, *e.g.*, that of the negative bath, be accurately known.

The hydrometer, graduated to suit silver solutions, in which condition it is known as an 'argentometer,' forms undoubtedly the simplest means of testing the strength of a silver bath. Its indications can always be relied upon to a grain per ounce of solution. Hence, in making up a new bath, the services of a pair of scales need not be had recourse to at all if the photographer elects to do without them. Placed in distilled water, the hydrometer stands at the zero point near to its upper end, and gradually rises as crystals of silver nitrate are added and become dissolved.

We have said that its indications may be relied upon, but this must be held as applying with absolute accuracy only to a solution composed of nothing but water and the silver salt; and by absolute accuracy we here mean, as just stated, a grain to the ounce, which for ordinary photographic operations is quite near enough.

The argentometer was first introduced into New York by Mr. Wm. Ross, who, under the name of the Actino-hydrometer, applied it, not only for ascertaining the strength of an aqueous solution of silver nitrate, but for the other solutions at that time made use of in photography, such as sodium, barium, and ammonium chlorides, potassium iodide, bromide and cyanide, ferrous sulphate, soda hypo, citric and tartaric acids, together with the percentage of other acids, such as nitric, sulphuric, hydrochloric, and acetic. With it was issued a table, by which, on noting the number on the scale of degrees inside the tube of the instrument, which stood on a level with the surface of the liquid in which it was immersed, the strength of the latter could, by referring to the table, be ascertained without any calculation being necessary. As the silver bath was the solution of which the strength was most frequently wanted to be known, the great majority of these actino-hydrometers were subsequently graduated for this special requirement. Hydrometers are made in two classes, one for solutions heavier than distilled water, the other being for fluids that are lighter, such as ether, alcohol, or ammonia.

But accuracy by the argentometer test cannot be attained after the solution has been in use for any length of time, and when the solution has imbibed products of that decomposition which takes place with the dipping of each plate, causing abstraction both of water and silver, their substitution by the nitrates of potassium, ammonium, or other bases of haloid salts, not to speak of the alcohol and ether, which necessarily find their way into the solution. We do not mean to say that what may be considered a moderately fair idea of the strength of the bath cannot be had for a considerable time after mixing a new one, but only that, in order to ascertain it with accuracy, another system must be adopted.

Volumetric or quantitative analysis is the one perfect method by which to know the proportion of silver present in a solution containing other ingredients. It consists in an application of the well-known fact in chemistry that certain substances in solution precipitate others according to fixed definite laws. To apply this to the case in hand. Chloride of sodium reacts upon nitrate of silver, forming a precipitate of chloride of silver which is not soluble in the liquid in which it is precipitated. On looking up the table of combining equivalents given in THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, it will be seen that the combining number of silver nitrate is 170, that of sodium chloride (common salt) is 58.5, which means that a solution of the latter, containing 58½ grains, will, if added to one containing 170 grains of silver nitrate, precipitate the whole of the silver (as chloride), and neither more nor less. This, it may be observed, represents 108 grains of metallic silver, with which, however, we have nothing to do in the present computation.

For the practical application of these facts in the testing of a silver bath, no simpler directions can be found than those given in Hardwich's *Manual of Photographic Chemistry*, in which it is recommended to take the pure crystallised chloride of sodium, and either dry it strongly or fuse it at a moderate heat, in order to drive off any water which may be retained between the interstices of the crystals, and then dissolve in distilled water in the proportion of eight and a half grains to six fluid ounces. In this way, a standard solution of salt is formed, each drachm of which, containing slightly more than one-sixth of salt, will precipitate exactly half a grain of nitrate of silver.

To use it, measure out exactly one drachm of the bath in a minim measure, and place it in a two-ounce stoppered phial, taking care to rinse out the measure with a drachm of distilled water, which is to be added to the former; then pour in the salt solution in the proportion of a drachm for every four grains of nitrate known to be present in an ounce of the bath which is to be tested; shake the contents of the bottle briskly until the white curds are perfectly separated and supernatant liquid is clear and colourless; then add fresh portions of the standard solution by thirty minims at a time, with constant shaking. When the last addition causes no milkiness, read off the total number of drachms employed, the last half-drachm being subtracted, and multiply that number by four, which gives the weight in grains of the nitrate of silver present in an ounce of the bath.

About a quarter of a century ago a simplification of the volumetric system was suggested by Mr. W. H. Wilson, of Liverpool. His requirement was that the number of drops or minims of a solution of chloride of sodium, which it took to precipitate the silver in a given quantity of nitrate solution should represent the number of grains of nitrate of silver to the ounce in that solution. The first thing was to fix upon a convenient quantity of solution to be tested, and a hundred drops were determined upon. By a simple calculation it was found that the solution of chloride of sodium must be thirty-four and a half grains to the ounce. It is thus stated:—As 170 : 130 : : 58·5 : 34·4; or, as the equivalent of nitrate of silver is to the number of drops to be tested, so is the equivalent of chloride of sodium to the number of grains to the ounce in the test solution. The apparatus required is a test tube and a pipette, or dropping tube. Measure into the test tube with the pipette 100 drops of the solution to be tested; rinse out the pipette, fill it with chloride of soda solution, and then drop carefully into the silver solution, counting the drops until it is seen that no more precipitate is caused. The num- of drops used, less one or two, which may be deducted, will represent the number of grains of nitrate of silver in each ounce of solution.

We once possessed a nitrate bath for sensitising paper, to which, for experimental purposes, we had added three or four hundred per cent. of nitrate of soda. Reading by the hydrometer, it was shown to be of enormous strength, something like 100 grains to the ounce; but, when tested volumetrically, its real strength was found to be a little under thirty grains per ounce.

Much might be written concerning applications of the principle of volumetric analysis to the estimation of the strength of silver solutions, but we shall conclude this chapter by giving a brief account of the system worked out and applied by Dr. Vogel, employing for greater accuracy the metric terms in which it was published. Ten grammes of iodide of potassium are dissolved in 1203·4 c.c. of water. (One hundred cubic centimetres of this precipitate exactly one gramme of nitrate of silver.) This is poured into a graduated burette tube furnished with a spring tap at bottom, and supported on a stand in the usual way. Enough of the solution is first run off by the tap to bring the surface of the fluid to the zero point of the scale. A solution of persulphate of iron of strength immaterial, and also a solution of starch, are provided. To make the test, place exactly one cubic centimetre of the silver in a glass vessel, and add thereto a little of the iron and a few (twelve or fourteen) drops of the starch solution. Now add the iodide drop by drop, shaking the vessel slightly so as to remove the blue colour, should such appear. At last a point is reached at which the blue colour remains permanent. viz., it does not disappear on agitation. Now close the tap and read the position of the fluid in the burette. If, for example, it stands at $7\frac{3}{5}$, then the silver solution employed contains $7\frac{3}{5}$ per cent., that is, $7\frac{3}{5}$ grammes of silver in every 100 cubic centimetres. This is stated to give extremely accurate results, and to be easily read off, owing to the colouration of the fluid.

XI.—Porous and Skinny Collodion and Combination Effects obtained from the Latter.

There are two main conditions in which collodion may exist, one in which it is so very tough and skinny as to be readily stripped from off the glass plate without tearing; the other in which it is spongy, porous, and "rotten" when spread.

Each of these conditions is valuable, according to the purpose for which it is to be utilised. The former of these would prove unsuitable for such a purpose as the formation of the primary film or substratum which is used in the collodio-albumen process as employed for negatives by Dr. Taupenot, or for stereoscopic transparencies by several other eminent Frenchmen. But of the more special and discriminative uses of skinny and porous collodion we shall take occasion to speak hereafter.

Some considerable time has elapsed since the discovery was made that, by immersing a sheet of blotting or unsized paper in sulphuric acid diluted with water, it becomes parchmentised. It is now an article of commerce, known as parchment paper, and is extensively used for covering pots of jam and other preserves. It also makes a good septum in dialysing or separating salines from colloidal substances. Any one is now at liberty to make it for himself, the patent, obtained by Gaine in 1857, having long since expired. In Gaine's process it was recommended to plunge unsized paper for a few seconds into sulphuric acid, diluted with rom half to a quarter of its bulk of water at ordinary temperature, and afterwards to wash in water containing a weak admixture of ammonia. Its special properties in the making of collodion are summarised tersely in the ninth edition of Hardwich's *Photographic Chemistry*, edited by Taylor, from which, without requiring the editor's permission, we make a brief extract to this effect:—Take a sheet of ordinary bibulous paper, and, having cut it into separate pieces, float them upon sulphuric acid diluted with half its bulk of water and cooled. Allow five seconds for the first, ten for the second, twenty for the third, and so on, until the last piece is gelatinised and dissolved, then remove the sulphuric acid carefully by washing, and convert them into pyroxyline. A marked difference will be perceptible between the samples of collodion so obtained. The first noticeable effect of the previous parchmentising will be an increased fluidity and freedom from structural lines. The collodion, when poured upon a glass, sets very rapidly, and with such firmness that the finger may be rubbed backwards and forwards without disturbing it. The film on lifting from the bath soon becomes partially surface-dry, and repels developers or fixing agents. When washed with water and dried, it forms a dense and highly varnished surface, nearly impenetrable by liquids. The moist film, after development with pyrogallic acid and fixing, appears unusually tough, and will bear pumping on without injury. It is also very contractible, and tends to draw itself away from the edges of the glass. When pushed aside, it can be pulled back again like the finger of a glove. The fixing agent never removes any portion of the image from this collodion, because the iodide of silver is in the film, and not only upon its surface.

The properties above described, while present in all the samples of paper thus treated, are more decidedly evident in proportion to the time during which the acid is allowed to act. When, however, the action of the acid is carried to that point at which the paper begins to soften and become semi-gelatinous, then will the collodion be entirely different, the film being rotten and powdery. It is to be noticed also that the solubility of pyroxyline formed of this parchmentised paper in ether and alcohol is increased when contrasted with that for which we gave a formula in a previous chapter. The intelligent reader will already have reasoned that by preparing and keeping in separate bottles two kinds of collodion, one possessing the extreme of toughness, and the other that of rottenness, the addition of either, in definite quantities, to average good working collodion, will aid in imparting to it their specific properties.

One use to which, within two days of writing this article, we have had occasion to put a horny collodion of the above-described class may be here described while the whole operation is fresh in our mind. It was the introduction of a figure from one negative into another negative, also containing figures. The system initiated by Johnston, of Wick, was that which was preferred. A portrait of a deceased member of a family was desired to be inserted in a domestic group, in order to complete the circle from which she was absent. The precise position she was to occupy having been determined upon, and with due regard to the lighting, a negative was taken the correct size from a larger photograph, the collodion employed being one of an unusually tough nature. By means of a camel's-hair brush and tincture of iodine, followed by reimmersion in the fixing bath, the surroundings of the figure were removed from the negative, the same means being taken to clear a space for the figure on the group negative, from which the varnish had been previously removed by caustic potash and alcohol in the usual way. It was then revarnished. Meantime the single-figure negative had been laid, face upward, in a rather strong solution of citric acid, which resulted in the tough collodion film being very soon found floating in the acidulated water, the film having left the glass upon which it was formed. After being washed, the dish had water to the depth of over half an inch poured into it, the group negative was laid on the bottom, face up, and the pellicular negative containing the single figure floated upon it and adjusted to the precise position it had to occupy. The toughness of the film permitted of this being done with the utmost ease, and without its showing the slightest tendency to tear. After draining off the water and drying the combination negative, a coating of varnish completed the operation.

Other applications of this system, such as placing a clergyman in a dimly lighted pulpit, or even putting the head of one person on the body of another, or similar forms of transference, will suggest themselves. If a figure is to be taken expressly for being transferred, some trouble will be saved if a black background be employed. A combination negative of the nature here described affords all the effect obtained by elaborate masking and double printing, with the additional advantage of simplicity of operating and identity of resulting prints.

XII.—Application to Lantern Slides.

It may, we think, be conceded as being fairly correct, if we say that nearly all the great wholesale manufacturers of lantern slides employ the wet-collodion process in their production. We content ourselves with noting this fact without seeking to institute invidious contrasts or comparisons between wet and dry, both of which have their partisans. One great distinguishing feature in their respective working may, however, be referred to: Whereas with dry plates the printing may be done either by contact with the negative in a printing-frame or by the copying camera, the utilisation of the wet process demands the services of a camera. This latter statement must be taken with a certain amount of qualification, because, by interposing strips of card between the negative and the wet face of the collodion plate, so as to ensure their not touching each other, a picture possessing very great sharpness may be obtained. This could not be done when the two are separated unless the precaution were taken to avoid parallax, by causing the light to assume the form of a point, which can be readily done by admitting the light into the exposing room through a hole in an opaque window screen, or a like precaution being taken if a gas flame or other artificial illuminant be employed. We have tried the experiment of separating the negative from the sensitive plate to such a distance as to permit of a half-crown piece passing easily between them, and exposing for about a second to a hole about an inch in diameter, cut into a sheet of brown paper, forming a screen to the window at a distance of three or four feet away. Although we have had occasion to employ this method of exposure, or a similar one, of using a lamp giving a small, although intense, flame, in the producing of lantern slides on wet plates, yet do we not recommend its adoption where it can be avoided, for this reason, that, no matter what care is taken, there is always a possibility of some of the silver-nitrate solution on the wet plate reaching the negative, which would be ultimately ruined if it were allowed to remain on, its removal being attended with some trouble.

With a camera of conjugate focus, as the copying camera has sometimes been designated, not only can no harm accrue to the negative, but the relative dimensions of the negative and the transparency may be varied to any desired extent; a 12 × 10 negative may have all or no portion of its subject reduced to lantern-slide dimensions, or, on the contrary, a small portion of any negative may be enlarged to them.

The collodion for lantern slides must be quite free from opalescence, at any rate from such as has not its transparency entirely restored by being subsequently varnished. It should also be thinner than that which proves best for negatives, and it is desirable it should be of a red colour from the presence of free iodine, which conduces to that perfection of the high lights so necessary in a high-class slide. As this has already been described in a previous chapter, it is not necessary to go over that ground again.

One point is, however, worthy of attention, and it is one connected with the iron developer. If an old or long-standing iron developer is examined, it will be found to have become of a yellow or pale sherry colour. This arises from the peroxidation of the iron. Now, it was long since observed that a clearness of the shadows characterised the employment of a developer in this condition, and it was also recognised that the old rusty copperas of the drysalter's stores made a better developer, as regards securing freedom from fog, than the purer ferrous sulphate; further, that the latter might be kept fresh and good, yielding a colourless solution by the presence of a trace of sulphuric acid. It was subsequently found that the anti-fog properties of the persulphate arose from its exercising a solvent action upon the incipient deposit suggestive of and correctly designated as fog.

To apply this to the topic now on hand: When developing lantern slides, it will be found advantageous to employ a somewhat common copperas encrusted with peroxide in preference to a sample of pure protosulphate, for the reason hinted, viz., greater clearness in the transparent portions. It may also be well to know that this condition of peroxidation may be induced in a developing solution made of pure protosulphate by dissolving the crystals, not in cold, but in boiling water. Into the chemistry of this it is not considered necessary now to enter.

What we have called clearness in a lantern slide may be ascertained by laying it down upon a white sheet of paper, and seeing whether there is any indication of degradation in those portions which should be clear glass—a bright sky, for example. The fixing may be effected by cyanide of potassium, followed by thorough washing.

It does not at all follow that a lantern slide should be condemned because the details are covered by a slight veil, because this may be removed by immersing the plate in a weak solution of cyanide, to which a few crystals of iodine have been added. A sharp eye must be kept upon it from the moment it is immersed to prevent the solvent action of this clearing solution being carried too far, because, if this is not attended to, the entire image may be found to have been dissolved out. If the foreground and middle distances are found to be correct, but the sky remains dingy, the local application of the cyanide clearer by means of a flat camel's-hair brush should be had recourse to. All this may be done in much less time than it takes to write this.

Toning the picture in most instances confers a greater amount of density than it possessed previous to this operation. A toning agent that makes the image black without conferring much density is a plain solution of bichloride of mercury. The duration of the immersion in this solution should be such that the colouration is seen on the glass or back slide when the plate is lifted up for examination. It must then be immediately and well washed, so as not to allow the action to proceed to the bleaching stage. If the resultant tone is found to be too cold, this is remedied by a subsequent immersion in a *very weak* solution of ammonium sulphide (sulphuret of ammonia); but, as this confers a slight additional intensity as well as warmth to the image, the judgment of the operator must be largely brought into play.

An agreeable, warm purple-black is obtained by a mixed toning bath composed of chloride of gold and potassium sulphide. Exactitude in either the strength or the relative proportions of either does not appear to be of great consequence, but the predominance of the potassium salt (liver of sulphur) tends to warmth. Indeed, this substance forms a toning agent itself without any other admixture. On account of its extreme cheapness, there is a tendency to make the toning bath strong, but this must be resisted, and the strength kept so low as to require at least one minute for its influence to be noted on the back of the plate.

Chloride of platinum is exclusively employed by some manufacturers in the toning of their slides. It gives a nearly pure black tone, which is liked by many. Like chloride of gold, the salt of platinum is commonly sold in sealed glass tubes, fifteen grains being a usual quantity thus enclosed. Being exceedingly deliquescent, it is better to measure out a definite quantity of water, say fifteen ounces, and, having inserted in the bottle containing it the unbroken tube of platinum, fracture it by crushing it against the bottom by means of a glass rod. One part of this may then be added to ten ounces of water, and this will be found to be quite strong enough for a toning bath. Being very acid, it is necessary that it should be brought to a nearly neutral state by carbonate of soda, and then reacidified.

If the transparency is a photographic enlargement of such an unpopular object as a bug, regard must be had to the colour, and for it, or things of a similar class, the toning should be effected in the following manner:—Make a cold saturated solution of bichromate of potash, dilute a portion of it with an equal bulk of water, and add thereto a few drops of hydrochloric acid. A transparency placed in this solution becomes of a delicate white colour, the metallic silver image being converted into the chloride. This, after washing, has a very weak solution of Schlippe's salt (sulphantimoniate of sodium) poured over it, by which it becomes of a scarlet-brown colour, very like that of the insect itself.

There are several other agents by which colour can be imparted to the image forming the transparency, but those mentioned embrace the best and most popular of the toning agents.

As collodion transparencies are so much more liable to be damaged than those made on gelatine, they should invariably be varnished as soon as they are finished. A crystal varnish composed of dammar dissolved in benzole forms a good protecting medium for transparencies. It is applied to the cold plate, and dries quickly and brightly.

XIII.—MOIST PROCESSES.

Up till now our description of the wet-collodion process has assumed the utilisation of the plate immediately after it has been rendered sensitive, and that no time is allowed to intervene between its having been taken from the silver bath and its exposure in the camera, or between this latter and the application of the developer.

For the first two or three years after the introduction of the process, several ingenious means and appliances were adopted by which it could be practised when away from home, these including tents of various kinds, series of baths affixed to the camera, and like expedients; but a growing desire was experienced for the adoption of some means by which the sensitised plate might be retained in a moist condition for a period more or less prolonged. The professional portraitist also desired easy means by which his spare time in the morning could be devoted to the preparation of sensitised plates, which should be ready for exposure immediately a sitter was ushered into the studio to sit for his portrait.

This latter desideratum, we may here observe, was latterly attained by the agency of a grooved water-tight plate box, filled with distilled water, in which the plates were stored after being sensitised, and where they could remain all day long ready for use, an immersion in the silver bath for two or three seconds previous to development ensuring results similar to what would have been obtained if all the operations had been performed at the time. Unless we are much mistaken, this method of preserving plates was for a considerable period maintained as a secret, and sold as such to several professionals.

The earliest suggestion as to the preservation of plates in a moist state came from Messrs. Spiller & Crookes, both of them at that time, as at present, accomplished chemists in selecting and trying the impregnation of the collodion film with salts having a strong affinity for water, and at the same time incapable of forming insoluble compounds with silver, after trying the nitrates of lime, magnesia, and zinc, the last was at first preferred. After sensitising as usual, the plate was transferred to a bath of fused nitrate of zinc, two ounces of which were dissolved in six ounces of water. Acetate of potash was afterwards found to give more advantageous results, and still more subsequently a solution of nitrate of magnesia, with a little acetic acid, was found to enable plates to be kept unimpaired for three weeks.

As an example of how experiments often run in parallel directions Mr. Shadbolt almost simultaneously published his honey process, which was for a long time a deservedly favourite one for keeping plates a considerable time after preparation. Having still a vivid recollection of the pleasure we experienced in working it, and of the many good negatives we obtained through its agency, we append a brief account of it.

After the collodion film has been excited in the usual manner, on taking it from the bath, it is drained as thoroughly as possible, and a little of a preservative syrup, prepared as follows, poured over the surface:—Dissolve 5 parts of pure honey in five parts of distilled water, and stir with a glass rod until the honey is quite dissolved, afterwards filtering the mixture, to which one part of alcohol is then added. As it was important that the silver left on the film should be reduced to a minimum without being entirely eliminated, the expedient was adopted, soon after the publication of the process, of transferring the plate, after sensitising, to a bath of distilled water containing a trace of silver only, in which it was washed,

The honey mixture is poured on and off, care being taken to allow it to penetrate every part of the film. The plate is then reared up on a sheet of blotting-paper, face to the wall, and time allowed for the paper to absorb the drainings, after which it may be placed either in the dark slide of the camera or in a plate box. The plates are not so sensitive as when used wet, but they keep well for a few weeks.

Previous to developing, the plates must have all the saccharine solution washed off by placing them in a flat dish with water, which must be allowed to flow backwards and forwards over them, and silver must be added to the pyrogallic developer; this latter must be done sparingly, to prevent the negative from becoming too dense.

Glycerine in various ways has been tried with more or less success in keeping plates moist for a few days or weeks. What we believe to be the best way of employing it is a method introduced several years since, by which a solution of nitrate of silver was mixed with glycerine and the bottle containing it then exposed to the sun for a few hours. A good formula for its preparation consists in mixing together equal parts of pure glycerine, distilled water, and of a thirty grain silver solution. Probably a little discolouration will take place by a prolonged exposure to light, but it can be rendered quite clear by shaking it up with a little kaolin, which may be allowed to remain at the bottom of the bottle in which it is contained, decanting off the clear solution as it is required.

This is poured over the plate after its removal from the silver bath and allowed to soak well in. The plate is then allowed to drain well, as in the before-mentioned honey process, after which it is put away for use. Either an iron or a pyro developer may be used.

For photo-lithographers or others whose business has much to do in the copying of maps or line engravings, either the honey or the glycerine process should prove invaluable because of the great intensity that can be obtained. The black lines will be perfectly clear glass, while the white paper will be absolutely opaque. The most intense negative of this class of subject that we have ever seen was obtained by coating a sensitised plate with a mixture of honey, glycerine, and silver solution, and developing with pyrogallic acid. No intensification of any kind was had recourse to; but, on the application of the developer, the image grew in density until it was absolutely opaque, the lines all the while remaining clear and bright.

XIV.—Dry-collodion Plates.

The convenience of employing a perfectly dry collodionised surface instead of a wet, or even a moist one, was, early from Archer's discovery, well recognised; but the conditions under which to ensure sensitiveness with a dried film were not at first known. It was well understood that, if the plate were dried without removing the silver nitrate, this latter would crystallise and disintegrate the film, while, if washed previous to drying, a greatly prolonged exposure would be requisite. We, however, are well aware of very beautiful ivory-like positives having been obtained on plates which had been washed and dried, and exposed only a little longer than if still wet, but with which the precaution had been taken of reimmersion in the silver bath previous to development with iron.

It is to Dr. Hill Norris, of Birmingham, we are indebted for first laying down the conditions under which plates could be made to keep for a protracted period, and his discovery has influenced the preparation of dry-collodion plates ever afterwards. Compressed in a few words, the conditions are, that, after removing the free nitrate by washing the plate while the film is yet in an open, pappy condition, and before it is allowed to dry and become horny, it should be immersed in a hot solution of gelatine, or that of a substance possessing like properties, *e.g.*, gum. This fills up the pores of the collodion, and ensures it setting in such a manner as to be subsequently penetrable by the developer after the film has been softened by immersion in water. An application of this nature causes not only permeability of the film by the developer, but organifies it, and deposits a protecting varnish on the surface, which prevents it from so readily getting damaged by abrasion as would otherwise be the case.

The principles of preservatives having been enunciated, numerous other substances, capable of acting in a similar manner, were from time to time suggested. It would be impracticable, in an article of this nature, to name them all, or describe their peculiarities of action, hence we will confine ourselves to a few which, from the certainty and excellence of the results obtained, caused them to become universal favourites.

A solution of tannin poured over and allowed to soak into a well-washed collodion film, and afterwards dried, gives a plate which keeps well before exposure, and yields a vigorous printing negative; but, if the development be delayed many days after exposure, the latent image will be found to have materially faded away. Hence, to ensure the best results being obtained, it is necessary to effect the development within one or two days after exposure. Infusions of tea and coffee were preferred by some to tannin, and strong advocates could readily be found for either. Dry plates, possessing a degree of sensitiveness equalling some of the gelatine plates now on the market, may be made by means of a collodion salted with eight grains of bromide of cadmium, and excited in a silver bath not less than sixty grains to the ounce. It takes from five to eight minutes to sensitise. The free nitrate is then removed by washing, after which the tannin, or similar preservative, is applied, it also being removed by washing. The image must be developed by alkaline pyro.

It is found that, if the organifier be composed of a mixture of gum with tannin, and this rendered slightly alkaline with ammonia, a still greater degree of sensitiveness is obtained. We warn any one who thinks of trying a strong purely bromised collodion not to make the attempt with an ordinary thirty-grain silver bath; for, upon immersing a plate in the silver solution, the silver bromide will be formed on the surface, and it will fall from off the plate in flakes, whereas it will not do so if the silver bath is richer in silver.

We are aware that many readers and experimentalists have a hankering after dry-collodion plates for certain purposes, and we here take occasion to inform them that, when employing gum as a preservative, this being known to give an exalted degree of sensitiveness, their efforts will not be crowned with that success they desire unless they make sure that the gum solution is not acid, but slightly alkaline. A preservative of this nature, which may be in excellent condition to-day, will, if tested two or three days hence, be found not to be alkaline, but acid, for it develops acidity with considerable rapidity, and this impairs the sensitiveness of the plates prepared by its means.

Albumen, when rightly employed, makes a good preservative for collodion plates for which a high degree of sensitiveness is not required. It behaves in a somewhat anomalous manner. If applied to a plate that has been washed on removal from the bath, and allowed to dry after the application, the plate will be lamentably lacking in sensitiveness; but, if the washing be so imperfectly performed as to allow some silver to be present in the film, and the albumen (the white of one egg beaten up with ten to fifteen ounces of water, with a few drops of ammonia to make it keep) be then applied, and, after a minute or so, well washed off with dashes of water, then will the plate be sensitive, keep well, and yield negatives of surpassing beauty.

But by far the best way of employing albumen as a preservative of collodionised plates is one that was discovered by a North London medical practitioner, Dr. Ryley, who, when experimenting with a view of ascertaining the effect of coagulation of the albumen employed as a preservative, found that hot water answered better than any chemical coagulator. After this discovery we rarely used any other means for preparing plates, except when engaged in experimental work. We will describe the routine of preparing, say, a dozen plates.

A plate is coated with ordinary negative collodion, sensitised in a thirty-five-grain silver bath and laid face up in a dish of water. A second plate is then collodionised, and placed in the silver bath. The first one is now removed from the water bath, and subjected to a spray of water from the tap; it has then a small quantity of the diluted albumen described above poured over it, and made to flow to each corner: this is important. The albumen is then dripped off at one corner, and a little fresh solution applied. Meantime a flat tin dish containing water has been quietly kept boiling on a stand over a Bunsen gas burner, and into this the collodionised plate, with its liquid albumen coating, is thrown, face up. The plate will not break; at any rate, we have thus treated numerous 10 × 8 plates and never broken one; but the albumen is coagulated almost by the first contact with the water. After remaining for about four or five seconds, the plate is deftly hooked up out of the hot water, and placed on a rack to dry, which, being hot, it does in less than a quarter of a minute. The plate, now in the silver bath, is transferred to the water, and a third one coated and made to take its place. In this way the operations are dovetailed into each other, and the operator will be surprised at finding how quickly he has got to the last one. It only now remains to pack the plates into a grooved plate box, or transfer them at once to the dark slides.

We have in the previous paragraph hinted the importance of causing the albumen to flow all over the surface. The importance of doing so will be apparent from the following experiment:—When applying the albumen avoid allowing it to flow over any definitely selected portion—a corner or a margin—of the plate, and then proceed as usual with the coagulation by the hot water. Upon subsequently developing the image a black stain will mark the portion to which the albumen was prevented having access.

There is an inexpressible charm in negatives obtained on these plates. There is transparency in the blacks, purity in the lights, and fine gradation throughout. When used for stereoscopic transparencies, they quite rival albumen ones, and, owing to the collodion film being protected by a layer of coagulated albumen, they do not readily scratch.

CHAPTER XV.—STRIPPING COLLODION FILMS.

We have stated in the opening chapter of this series of articles that it was not the idea of the introducer of the collodion process that the pellicle should remain on the glass plate, but rather that it should, after the formation of the image, be removed from its fragile support and be used as a flexible film.

But it was found to be not quite an easy and certain procedure to effect the desired separation at all times without the occasional tearing of the film. Hence the principle was adopted of strengthening the pellicle previous to attempting its removal. In the same year (1855), both collodion positives and negatives were, by different individuals and different methods, removed from the glass plate.

In order to strip a positive, Alexander Rollason first produced the picture in the ordinary way, and then immersed it in dilute nitric acid, and allowed it to dry, after which colour, if desired, was applied, and a solution of asphaltum or Brunswick black in mineral naphtha of the consistence of cream was poured over it, a paper backing was applied, and, after being placed in water, the picture separated from the glass.

It was subsequently found that black japanned leather or cloth, after being sponged over with acidulated alcohol and water, and pressed in contact with the collodion film, answered equally well, and flexible portraits of this nature were for several years regular articles of production.

For transferring negatives, Scott Archer applied to the finished and dried negative a varnish composed of gutta percha dissolved in benzole; and, when dried by a gentle heat, the negative was placed in water, whereby the combined film left the glass plate, and could be retained in a portfolio.

Other methods were afterwards devised. One was to transfer the film to a sheet of transparent gelatine by the agency of a liquid cement. Hill Norris's system, which formed an item in the patent granted to him for the preparation of dry plates, to which we have previously alluded, consisting in applying a strong solution of gelatine to the collodion picture, and, after permitting it to dry, giving it another coating of plain collodion, and stripping the compound film, which, while impervious to moisture, was also strong, elastic, light, and quite secure from the possibilities of breakage.

Numerous modifications of this combined film system were about this time suggested and successfully adopted, one of considerable excellence being to apply to the collodion film a varnish composed of any material insoluble in ether and alcohol—a favourite application consisting of a solution of indiarubber in benzole—and finishing with another application of collodion. Perhaps the system which has its analogue existing with the greatest vigour at the present time was that of Parkes, of Birmingham, which consisted in discarding the use of glass as a supporting medium, and substituting therefor a somewhat thick sheet of collodion (celluloid), on which was supported the iodised layer that was to be impressed with the image. The similarity of this to the gelatine-coated, rollable, and flexible celluloid films now so extensively used will suggest themselves, and yet precisely thirty-eight years have elapsed since Parkes' invention. Many excellent ideas were thrown out in the earlier times of photography, which are only now finding congenial soil for their fructification.

Without the stripping of the collodion film from the plate, ceramic photography would not have attained such a high place as that which it now occupies. But in this process it does not do to have the film strengthened by organic compounds, like the others. The routine is something like this: A collodion transparency having been developed and fixed, is, after washing, transferred to a vessel of acidulated water. Tartaric, citric, sulphuric, and other acids appear to answer equally well as acidulants. In a brief period the film will be found to have floated from off the glass plate. It is then toned by being transferred to a solution of platinum, iridium, gold, or such other toning bath as is preferred. The slower and more thorough the toning, the better is the result. This toning may be effected while the film is still attached to the glass plate, although experienced enamellers prefer its removal from the glass prior to toning. After having been toned, the film, when floating in the water, is caught up on the surface of an enamel plaque, which is slidden underneath, after which it is burned in by the muffle furnace.

Stripped films are found very useful in certain photo-mechanical methods of printing, which, if the printing surface were produced direct from the glass negative, would yield a reversed picture. This is obviated by the reversed pellicular negative.

XVI.—Practical Directions for Stripping Large Films.

Before dismissing the subject of stripping colodion films from off the glass plate, we think it well to give a synopsis of a method that has been much practised in America, having found great favour there among photo-lithographers and others. There is no essential difference in the principles underlying it and those we have described in a previous chapter; but sometimes little matters in detail form the difference between success and failure.

But first of all, a word or two on substrata. When a collodion negative is taken with the intention of its being afterwards stripped from the glass support, it is desirable that the plate, after being cleaned, be rubbed well over with powdered steatite or French chalk. This treatment has a twofold property, in fact it may be considered as possessing properties quite antagonistic to each other, for it causes such an adhesion of the collodion as to enable it to resist what might otherwise be considered a decidedly loosening action engendered by, possibly, a series of intensifications and intermediate washings. No matter what these may be, the film adheres throughout. The antagonistic property of French chalk is this, that when the film is dry, it becomes a very easy matter to strip it from off the plate and in the preparation of a plate intended ultimately to be employed. But, while French chalk is such an excellent and easily applied substratum, our readers will know that a solution of white wax answers equally well, so far, at any rate, as regards stripping facilities.

Having prepared a plate with the substratum, apply a coating of plain (uniodised) collodion of a good body—that is, one containing from six to eight grains of cotton to the ounce of solvents—and, when well set, lay the plate in a flat dish of water, imparting a rocking motion to the same until the water is seen to flow smoothly over the surface without any seeming greasiness being apparent. Instead of being washed in a dish, it may be done equally well by a rose faucet attached to the ordinary water tap. For that matter, the washing may be done by a common garden watering pail out in the open daylight—a method of which we have just proved the efficacy by doing so on an 18 × 15 plate.

After allowing the water to drip off, coat the surface with diluted albumen, in the proportion of the whites of two eggs to a pint of water, the whole having been well beaten up together. When dry, the plates may be stored away till required for use, when they are coated with iodised collodion, sensitised, exposed, and developed in the usual way. Having been washed, a second application of the diluted albumen is made, and the negative is dried.

It is now ready for the final varnishing with plain collodion, in which have been dissolved six or eight drops of castor oil. This is allowed to become dry.

To remove from the glass, run a knife around the margin, when the combined film will leave the plate with facility. The pellicular negative will be tough and strong, and, owing to the presence of the castor oil, will remain flaccid, and not be inclined either to curl or crumple.

One special advantage of this system, hinted at in a previous chapter, is the excellent manner in which a pellicular negative lends itself to the preparation of surfaces for mechanical or process printing—such as collotype and photogravure—without reversing the position of the scenes, whether figures or other compositions, on the finished prints; for with a collodion pellicle it will be readily understood that there is absolutely no practical difference in the sharpness and gradation obtained, when either the front or the back is in contact with the sensitive surface.

A MODIFIED METOL DEVELOPER.

By F. C. Beach (New York).

For the past two years I have experimented more or less with the metol developer, and have noticed, when ordinary or chemically pure sodium sulphite is used as a preservative without an alkali being mixed with it, the solution will keep reasonably clear for about a month, then it will become discoloured, and eventually turn quite a dark red. Its activity in this condition is not as powerful as when clear.

Having been successful in preserving pyro in solution with sulphite of soda and sulphurous acid, I attempted the same use of it with metol. At first I added too much acid, which acted as a great restrainer, but it kept the developer very clear. The following is the formula I now prefer:—

Water	16 ounces.
Metol	48 grains.
Sodium sulphite	192 ,,
Sulphurous acid	½ ounce.

For an alkali, dissolve 1 oz. of carbonate of potash in 3 ozs. of water. Used as a developer for lantern slides, take 1 oz. of the metol solution, add ½ oz. of water, and ½ drachm of the potash solution. This will develop easily one dozen slides in succession at a cost and estimate of less than a cent for the metol. It produces remarkably clear slides perfectly free from stain and fog. For negatives, the quantity of metol solution and potash solution can be slightly increased to advantage.

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TRAVELLING WITH CUT FILMS.

By W. Washam.

I am sorry that this year I have been too busy to profit by the instruction which The British Journal of Photography always contains, or, indeed, to pay much attention to photography in any way. I have, however, in landscape work, made certain very satisfactory trials with cut films. It may be interesting to some readers to learn how I have arranged to work with these most easily when travelling about, and at the same time, if not too late for The British Journal Photographic Almanac, to prevent my connexion with the friendly Editor from being altogether severed for this year.

I will not enter into the question of development as I count on being able to give the films so nearly the correct exposure as to have no difficulty with the development after my return home.

I have taken with me, in my travelling basket-trunk, camera, lenses, shutter, folding tripod, light-tight changing bag with opening in front to put in slides, &c., but covering up again light-tight, and armholes with elastic bands at the two corners. Three double slides, a metal box light-tight, with opening rather less than one inch and a quarter. For this box, whose other dimensions are somewhat larger than those of the films, I have made of suitable waterproof material, a double pocket with stiffened sides, and length and breadth slightly more than those of the films.

The pocket is made double by a middle partition terminated outside by a double flap, which falls in opposite directions and covers the double opening in the pocket. Into one division are introduced all the films to be used on the journey, taking care to place all the sensitive surfaces in the same direction and to notice which, that no mistake may be afterwards made when manipulating in the changing bag. The pocket is now placed in the metal case and a strip of adhesive tissue placed round the opening where the two parts join—the case being in two parts one sliding over the other—so that the case is now air-tight as well as light-tight.

As a backing for the films when in the slides, I have provided pieces of stiff cardboard of suitable thickness, to one side of which I have attached pieces of velvet, the whole being of a dark colour. Now introducing the dark slides, the velvet cardboard backings, and the metal case, with the films into the changing bag, it is easy to place the films one by one properly in the slide with the backing. When the films have been exposed the operation is repeated; but this time care must be taken, in first removing each of the exposed films, that it is placed in the other division of the pocket exactly in the order of the numbers on the slides. As I always note in my pocket-book the particulars of each exposure with number of film and of slide, and keeping this before me when developing, I know all about each film as I take them in order from top to bottom or from bottom to top. I can place in the pocket a large number of films. If they were not sufficient for my journey, it would, of course, be very easy to provide other similar cases, or one case of wider dimension. The whole arrangement is very compact, and there is no difficulty in changing the films wherever one may be.

THE REPRESENTATION OF MOVEMENT.

By H. W. Bennett.

The successful representation of movement by photography is a very disputed question, many claiming that, while a painter may so depict a figure or an object as to instinctively convey the impression of action as motion, the same power is denied to photography.

A painter's success in representing movement is frequently judged from the standpoint of conventionalism, and a photographer's work condemned because he cannot adopt conventional renderings that are, in many cases, not only untrue, but, in addition, unlike the impression that the movement conveys to the eye. It is only necessary to compare pictures by the best artists of forty or fifty years ago with those of to-day to see how great has been the influence of photography on painting, especially in regard to correctness of drawing and perspective; and it would be a step backwards if photography were to sacrifice one of its greatest powers, correct delineation, for an attempt to reproduce a painter's conventional rendering. The assertion that a painter succeeds by drawing a composite of a series of movements is only true in so far as the actual position shown is one that occurs during the action, and successful only in proportion as it expresses and emphasises the character of the movement. Strictly speaking, this is not a composite, but simply the recording of facts, for which the photographer has, at least, equal facilities as the painter.

It does not follow that every photographic transcript of motion, because scientifically correct at that moment, is a true rendering of movement, a large proportion of the photographs of moving objects entirely fail to suggest motion at all. Some are simply caricatures, especially since there have been so many users of the hand camera who snap their shutters indiscriminately without any thought of serious work. Photographic possibilities cannot be estimated from such men's results.

That the impression of motion can be successfully conveyed by photography is unquestionable, if the photographer, like the painter who avoids conventionalism, would carefully and systematically study and analyse the movement that it is desired to represent. In every action there is a position which is so essentially characteristic, that, if that position can be seized, and transferred to plate, paper, or canvas, the picture would thoroughly express the action represented. As an example might be quoted, a blacksmith forging; if a rapid exposure were made as the hammer was falling, and near the anvil, the result would suggest anything rather than that he was striking a blow; but, if the moment selected were that when the uplifted arm, the distended muscles, and the firm grip of the hammer all told of the force that was concentrated for the coming blow, the finished photograph would convey the same impression.

In some actions this characteristic position is almost one of rest; and in most cases, if the direction of movement is oblique towards or from the camera, it will be found not only far easier to determine the critical moment for making the exposure, but also that the suggestion of motion is better realised. In addition, a considerably longer exposure can be given without undue blurring, frequently a great advantage. A photograph of a yacht taken purely broadside very rarely has the life and movement that a more or less oblique view possesses.

The exposure should be almost always sufficiently short to secure fairly crisp definition; if so prolonged as to cause blurring, there is a risk of the character of the object being destroyed, and the sense of motion, the object of the exposure, being lost. There is far greater risk of failure from blurring of the image than from too crisp a rendering; breaking waves never look frozen or unnatural from having received too short an exposure, but rather from an unsuitable moment and position having been selected.

CUT FILMS.

By E. H. Fitch.

Several years' experience in the preparation of cut celluloid films persuades me that there is no reason for suggesting that films are liable to undergo qualitative changes, or that they are prone to exhibit defects which plates are not also subject to. Under normal conditions of atmosphere and temperature, the film of celluloid itself is as chemically inert as glass with regard to the sensitive coating. Of course, much depends upon the quality of the celluloid, but I am assuming that to be chosen with a view to the absolute prevention of any reaction between the emulsion and the support.

It has been suggested that, in a tropical climate, the latent image on a celluloid film is liable to fade, and it has also been variously held that, by prolonged keeping, films (1) show deterioration of sensitiveness, or (2) that they increase in speed. The data upon which these conclusions have been based are of the most meagre description, and such as do not justify one in accepting the former without question, but the latter effect I have myself verified. The same phenomena have been ascribed to glass plates on the same insufficient grounds. My own experience of celluloid films is that, given equable conditions governing their method of preparing, keeping, and storage, their properties and qualities, at any rate for a period of several years, remain unchanged.

Such theories as that the camphor used in the preparation of the celluloid reacts on silver bromide, or its assumed subsalt, and that the sensitiveness of the emulsion is affected, *per se*, by the support, may be dismissed as untrustworthy. I, at any rate, have failed to confirm them.

It is needless for me to discuss the peculiar merits and advantages of cut celluloid films, inasmuch as they are perfectly well recognised; but I will conclude this brief communication with the advice, which is founded upon experience, that, if a photographer treats cut celluloid films as far as possible in the same manner as he would glass plates, he will take the best possible step towards reconciling himself to their constant use, always provided, of course, that the films are *ab initio* what they should be.

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EPITOME OF PROGRESS,

WITH NOTES ON PASSING EVENTS, ORIGINAL AND SELECTED.

By The Editor.

PHOTOGRAPHIC IMPRESSIONISM.

Mr. Thomas Bedding has been recently analysing this moribund craze. He says:—

An Impressionistic Fever.—There is an impressionistic fever abroad. Impressionism is apparent in our fictional and dramatic literature, in painting, and other graphic methods of representation, and had I the time, and you the patience to follow me, I do not think it would be difficult for me to trace its presence in modern manners, in the columns of the newspapers, in music-hall entertainments, in the austere realms of Science, and in many other less-suspected places. But it will meet the needs of the present case if I do not step outside the limits I have laid down for myself. Within those limits I, of course, place photography, which also, it is hardly necessary to remind you, has its impressionistic phase.

Some may ask what is meant by impressionism. I prefer not to bind myself to any hard-and-fast definition, but to explain the term, as it is commonly understood, by one or two simple illustrations. Thus, in stage literature, Ibsen, the Norwegian writer, has created for us a world of beings, supposed to be ordinary or average persons, who do and say things which are not discoverably done or said in actual life. His men and women pair and unpair on the most insufficient grounds; they commit suicide and other mistakes on the smallest or no provocation; and, most wonderful of all, his young mothers, having taken years to discover that their husbands are not quite what they originally thought them to be, calmly run away from them, and (marvellous to say) their babies as well, without a pang! All this, besides being untrue to common human nature, reveals the strivings of a diseased and fantastic imagination after something unconventional, new, strange, and, sooth to say, disagreeable.

So with general fiction, which is, in part, the reflection of what a nation's intellectual recreation is. To the modern novelist and story-writer we owe that uncanny creation, the New Woman, who, if she really existed, would be a little worse than an indifferent man, which is saying much. Then, again, some writers carry their striving after new effects to the extremity of attempting to plan out their narratives according to some imaginary scheme or design. Thus, a particular incident or scene is supposed to typify a given part of the chromatic scale—a murder suggesting red; remorse, blue; jealousy, yellow; and so on, until your book, with a considerable quantity of what the late Mr. Dickens's Marchioness called 'make-believe,' may be supposed to approximate to a tolerably close allegorical reproduction of the solar spectrum. As to painting, and what is admitted to be the very essence of impressionism in its total disregard of the conventional methods governing colour, lighting, and definition, examples are just now too numerous in the neighbourhood of Piccadilly and St. James's to need mention at my hands. Go and see them for yourselves. Finally, not to unduly lengthen this part of the paper, the growing tendency of the better class of black-and-white illustrators to veer towards a dreamy suggestiveness and vague indefinability of style and form has culminated in the evolution of that remarkable young man, Mr. Aubrey

Beardsley, whose drawings and sketches are appallingly original and eccentric. On the whole, from the foregoing illustrations, it may be deduced that impressionism cares nothing for truth; that it follows the imagination wherever it turns; that it seeks to know no amenability to intellectual discipline; that it is, in fact, the expression of unbridled licence, an eager yearning after the new, the strange, the grotesque—after anything or everything which has in its composition something in the nature of a revolt against generally accepted forms and ideals.

The Revolt against Conventional Photography.—The parallel, I humbly submit, extends line for line to photography, in which impressionism has plainly—perhaps too plainly—manifested itself of late. During the last ten or twelve years many influences have exerted themselves on photography to ensure the possession to camera pictures of higher natural truth, and more of the elements of refined taste, realism, and æsthetic charm, than was the case within all our recollections, until pictorial photography has reached a stage of excellence in effective translation of most subjects of which we are proud. But already some of us appear to have tired of the limitations by which we are bound, and have revolted against the old and intelligible methods of expression with, perhaps, not the most happy results. What are the effects and consequences of this revolt? We have all heard of the problem play and the problem novel—grotesque things with jargon names invented by impressionistic writers of the kind to which I have referred. They invariably conclude with a note of interrogation, while the meaning of the entire work is left equally unintelligible. Here, too, the parallel holds good in photography, for have we not with us now the problem photograph? Under the plea that they possess 'individuality,' 'imagination,' 'feeling,' 'subtle tonality,' and other qualities, laboriously conceived and executed nebulosities and crudities are now produced, evidently meant to look as unlike photographs as it is possible to make them, and which we are asked to fall down and worship as the apotheosis of pictorial photography. Surely, now that we have reached that stage in the history of pictorial photography, when on the walls of our exhibitions it is possible to have representations of nature as nature may be conceived of but never seen, and the titles of which are just as puzzling and debatable as are the 'pictures' themselves, we may pause and seriously ask ourselves what photographic impressionism is, whither it is leading us, and how long the thing itself is likely to survive the ridicule it challenges.

A Protest against Photographic Impressionism.—Of course I am not decrying the play of disciplined thought and imagination in pictorial photography; but I am in all humility protesting against the many sombre and inscrutable impressions of the face of nature which are being passed off as illustrative or typical of the picture-producing powers of photography. "A *picture* is seen in an instant" is a remark attributed to the late Thomas Constable. There are some so-called pictorial photographs which were hanging a few weeks back in a gallery not a hundred miles from Piccadilly which could not be seen in a century. Why should this be? After all said and done, in the bad old days of blank white skies, poor composition, microscopic definition on every plane, faulty lighting, and other defects, you could always see what a photographer was driving at in his picture; but it is not so nowadays, thanks to modern photographic impressionism. Again I ask, why should this be? Is Nature herself always an enigma, a problem, or a note of interrogation?

No, gentlemen, Nature is not nearly so black as she is photographed—according to the new style. She is not mostly fog or mist-bound; the skies are not always covered with storm clouds; it is not always gloomy evening when we go out with our cameras; and the grey, formless, dull, depressing, indefinably shadowy moorland, river, and landscape views that so largely abound do not by any means give a fair idea of Nature's moods. Bless you, no! The sun sometimes shines; the sky is occasionally blue and flecked with golden yellow clouds; and now and then the grass ripples and waves, the trees are a mass of shimmering leaves, the flowers bloom, and the air is clear and transparent. It may be well to place this interesting fact on record; the newest photographers do not seem to be aware of it.

A square inch of photograph is theoretically more valuable than a square foot of frame; fortunately, however, all photographers do not think so. Rough-surface papers are not more difficult to manipulate than albumen paper; but they admirably lend themselves for printing technically defective negatives, so that their use must not be too rashly ascribed to the exercise of æsthetic acumen. In the production of pictorial photographs a knowledge of technical photography is no disadvantage, whereas, in impressionistic photography, it is usually superfluous. Impressionistic photography does not necessarily involve the employment of both a camera and lens, but their use and possession need not on that account be held to constitute a mark of intellectual inferiority.

PHOTO-ENGRAVING WITH SILVER SALTS.

Mr. Leon Warnerke demonstrated the following process before the Royal Photographic Society:—

The process which I have to communicate is, I believe, but little known, although it is about fifteen years old. When it was originally introduced, the photo-engraving processes were not in vogue, but since that time, mechanical printing processes having been brought to a great degree of perfection, greater attention has been given to the subject, and I think the time has come to give a full description of this process, which I have never done before. The process is based upon the following principle: A gelatine silver emulsion is coated upon paper in a manner similar to the preparation of carbon tissue, except that a salt of silver (bromide or chloride, or a mixture) takes the place of the pigment; the sensitised paper is exposed behind a negative, and developed with pyrogallol and ammonia (no other developing agent is suitable), whereupon the portions of the emulsion which have been acted upon by light, and subsequently by the developer, are rendered insoluble, and the unaffected parts can be removed by treatment in hot water, as in the carbon process, the print being then in a condition to be used in the manner usual in the processes of photo-engraving. It can be applied equally well for either letter-press or copper-plate printing. My method differs from the processes now in general use in that no salts of chromium are employed, but salts of silver; and, secondly, because, instead of a prepared metal plate being exposed behind the negative, and afterwards developed with hot or cold water, in this case the paper tissue is exposed, developed with pyro and ammonia, and then transferred to the metal plate.

This mode of procedure permits the contact between the glass negative and the paper tissue to be secured much easier than between the glass negative and metal plate, and renders unnecessary the reversal of the negative.

As the ink used in copper-plate or letter-press printing is not capable of producing half-tones in the finished picture, the tone gradation must be secured by some other means, and is generally secured by a system of dots or points of different size. There are several methods of producing this grain. One method very largely employed at the present time consists in taking the negative through a screen of finely ruled glass; a second is by dusting powdered asphalt upon the metal plate, and afterwards developing the image upon the plate so prepared. For letter-press work, of course, a negative only is required; but, if the copper-plate process is employed, the transparency must be a positive. For the purpose of this demonstration I propose to use a portrait of our President, having obtained, by his permission, an albumen print from Mr. H. S. Mendelssohn, the author of the portrait, from which I have made a negative through a screen produced by Levy, of America, and having 133 lines to an inch. The screen consists of two plates, ruled each in different directions, and cemented together so as to form practically one piece of glass; it is placed in the special carrier in the dark slide, and in contact with it is placed a sensitive plate. I used the ordinary gelatino-bromide plates; on this occasion it was a plate prepared by Messrs. England—slow, but very clear.

To illuminate the portrait I used my favourite magnesium lamp, and I find that the interposition of the screen between the plate and the transparency increases the exposure necessary by about three times. For producing the negative (which I pass round for examination) thirty inches of magnesium ribbon were burnt, half on one side of the frame, and half on the other, lens *f*-11. It is very important that the glass screen should be perfectly clean, as the network is so fine that the slightest dust upon it will render good results impossible.

I will now proceed to work the process. The negative which you have seen is placed in the printing frame with a piece of sensitised paper, and the metal plate is next prepared. I use a copper plate, but brass would do as well. I have succeeded in obtaining a fine-surfaced copper plate, requiring very little polishing, and which does not produce the 'devils' which are sometimes met with in process work. Snake-stone, followed by charcoal, is used for polishing the plate, which should be placed upon a board covered with thick felt to prevent slipping, and, after the polished plate has been washed, it is ready for transfer. I now make the exposure by burning a sufficient length of magnesium ribbon (in this case about four inches, the negative being very clear) and develop with the following:—

A.

Water	100 parts.
Pyrogallic acid	10 ,,
Citric acid	1 part.

B.

Water	100 parts.
Ammonia	12 ,,
Potassium bromide	4 ,,

To develop, carefully measure 10 drops of A and 14 of B, add about 45 c. c. of water. Wash the exposed tissue in order that the developing solution may flow freely over it, and apply the developer, mixing a fresh portion if it becomes discoloured. If the development is prolonged, it is necessary, after developing, to neutralise the last trace of ammonia with acetic acid in weak solution, or the emulsion will be rendered too insoluble on the surface. The print, being developed, is squeezed into contact with the copper plate. It is a good plan to press in this stage for one instant in the copying press (not too strong).

At this stage the manipulations do not differ from those of the carbon process, except that the carbon tissue requires to remain for at least a quarter of an hour before development is proceeded with. In this case, hot water is applied almost at once, and the paper removed, leaving the emulsion on the plate. The unaltered silver is then washed out with warm water (about 30° C.), exactly as in the removal of the pigment in the carbon process. When this is completed, the image is seen to be formed of very fine points, like needles, and they are swollen, and, if they were dried slowly in this condition, little filaments would remain between them.

It is therefore requisite to cause these swollen points to shrink, and this is done by the application of alcohol, first diluted with half of water, and followed by the strong alcohol—ordinary methylated spirit will do. The plate is then ready for etching. It is better to allow the plate to remain for several hours to get thoroughly dry, as damp gelatine is easily affected by the etching solution.

A different class of grain is produced by the use of asphalt in the dusting box, the construction of which is shown in the print which I pass round, and a similar effect can be obtained by dusting the plate with asphalt powder from an indiarubber ball or bellows. The plate, with the asphalt deposited upon it, is placed upon a stove or heated over a flame, in order to partially melt the asphalt and cement it to the plate.

The copper plate, while heated, changes colour, and when it acquires a steel colour the plate is in proper condition, and, after the plate is cooled, the image can be developed upon it. Observe that the image upon the plate is not fixed with hyposulphite of soda in the usual way, as the hypo dissolving the silver salt in the emulsion would silver the plate, which is not desirable. The etching is performed by solutions of sesquichloride of iron of different strengths, those which I use being respectively 45°, 43°, 40°, and 37° Beaumé. The strongest solution is applied first for ten minutes, afterwards the second and third for the same time, and, finally, the 37° for fifteen minutes. The gelatine is removed from the surface with a solution of a caustic alkali, and the plate is then finished and ready for printing from, except that it is sometimes necessary to remedy some imperfection or etch certain parts more deeply. The *clichés*, which I shall show you and print from, have not been treated in this way, but are just as they were etched when removed from the etching solution.

There is no absolute necessity to make a negative through the ruled screen. An ordinary negative can be taken, and the ruled screen on the film put in contact with it, and this printed on the argentic tissue and treated as previously described. In order to secure the utmost sharpness, no glass should be interposed between the negative and screen or argentic tissue, and for this reason either the negative or the screen must be on the film.

HEATING STUDIOS.

MR. CHAS. H. EVANS, in THE BRITISH JOURNAL OF PHOTOGRAPHY, gives his experience on this subject.

After all sorts of experiences, lasting over many years, of open fire-grates, stoves (slow combustion and otherwise), hot air, as in the Calorigen, &c., I know of no other method by which so even a temperature can be maintained at such low cost, and with so little trouble, and also with an entire absence of dust. Again, it would be quite possible, in building new establishments, to so contrive it that the pipes might be inside an ornamental and perforated skirting board, so that their unsightliness could be hidden, yet easily getatable in case of need. When I first thought of adopting hot-water heating, I had several conversations with a horticultural friend on the size of the pipes, and he, with the experience of years, recommended nothing less than the orthodox four-inch pipes. But I reasoned with him thus: 'You are obliged to use such an area of heating surface because your roofs are *all* glass, and your side walls low and not very thick. In my case I have, comparatively, but little glass surface, and substantial high walls.' Well, the result was I had fixed the two-inch size, and the apparatus has been in constant winter use since 1887, and up to the present has never cost anything for repairs, and has done its work efficiently and, I think, with extreme economy, when it is considered that the average consumption of coal is but two tons annually.

During the late frost the fire was never out but once, and that through carelessness; even then the pipes did not cool. Now a word as to the stoking. The boiler is of the ordinary saddle pattern, and works nearly 190 feet run of piping perfectly. I use anthracite coal exclusively, except when relighting, when for ease and speed the ordinary bituminous coal, or a couple of bricquettes (locally called patent fuel) are used. In this neighbourhood anthracite coal is largely produced, and is therefore easily obtainable, and costs 15*s.* per ton; but, doubtless, in all the large towns coal merchants supply it for greenhouse fires. To the uninitiated this coal might be easily recognised by its extreme hardness and stonelike character, its slow-burning qualities, extreme heating power, and absence of gassy flames during combustion—in fact, burning a dull, cherry red. After the fire is once lit, the *modus operandi* is as follows: Pull out the damper the first thing in the morning (about 9.30), then thoroughly rake out the ashes and any clinkers there may be on the fire bars; add fresh coal to fill up in about an hour or less. The damper may be closed more or less according to the requirement. In the evening (5.30) refill with coal and throw on a shovel of ashes over the lot, so as to lessen the draught. With a week's practice one will be able to gauge to a nicety the adjustment of the damper. Of the comfort of finding the whole of one's workrooms and studio at a nice temperature the first thing of a winter's morning, I need not enlarge upon. Nor have I mentioned the use of coke as a fuel, though I have tried it, for, besides being a constant source of danger in a photographic establishment, it has not the advantages of anthracite coal from an economical or heating point of view.

A NATURALIST'S CAMERA.

DALLMEYER'S recently introduced Naturalist's Hand Camera is, in our estimation, a most useful instrument. In the front is the lens, and on the top is seen a species of focussing telescope, in which the eye observes the image formed by the lens, reflected in a line parallel to its axis by means of reflectors. When everything is seen in accurate focus, the trigger is touched by which the lower reflector is thrown out of the way and the image impressed upon the sensitive plate.

A PATENT LEVEL.

A HIGHLY compact and useful little level has been introduced by Messrs. Perken, Son, & Rayment. Although only a little over an inch in length, it suffices for bringing either the smallest or the largest camera to a perfect level. When folded in its recess, it is in position for levelling the axis of the camera, and when opened out it is in position for levelling the transverse of the camera. The whole thing is neat and useful.

A COMPACT LENS.

THIS firm has also minimised the bulk and weight of the quarter-plate, or the 5 × 4 rapid rectilinear lens, in a remarkable degree. The mount is of aluminum with an iris diaphragm, and the diameter exceeds that of the lenses by a mere fraction. Although the mount is so small, there is no reflection from the sides, and it covers well with an aperture of *f*-8. Query: Are not the bulk and weight of the majority of lenses at the present day needlessly great? The lens now under notice shows an advance in the right direction.

A MODIFIED EMULSION FOR NEGATIVES.

MR. EDWIN BANKS thus describes this interesting process:—

These lines are written with the special view of assisting and simplifying the work of those who, like the photo-lithographer and process workers generally, still have recourse to the old methods of negative production by means of collodion and silver bath. With the results of work so produced I have no word of complaint to make. As an old collodion worker, I am still old-fashioned enough to believe that equally fine negatives can be produced by that process as are possible by the modern gelatine dry plates. But it cannot be denied that, as a process, the wet-plate method is attended by such a formidable array of difficulties, that the operator is kept in a constant state of expectation and dread of the bath going wrong, and it takes no small skill to keep the chemicals and bath in good working order. In spite of every precaution and care, when the working materials have been left, after a day's work, in perfect order—bath filtered, collodion decanted, plates cleaned and albumenised—on proceeding next morning with the day's routine of work, the operator finds a sudden development of fog, streaks, comets, pinholes, and other abominations of which the modern dry-plate worker has no conception, and which will defy for a time all the remedies which experience can apply to cure them. If conquered for a while, it is only to reappear in some other and aggravated form in a few hours or days.

There are, however, qualities inherent in collodion negatives which are of special value for certain commercial purposes, and which are not present in gelatine, and which render their production of great importance and value. Any method by which the whole or greater part of the wet-plate man's trouble can be done away with, and that without sacrificing any of these special qualities, must therefore be of peculiar interest and usefulness. I do not propose to discuss the probability or possibility of substituting dry gelatine plates for collodion. If only as a matter of economy, the latter will be difficult to displace from the process worker's laboratory, where constant changes of size in plates required, from quarter-plate to twenty-four inches, would, with the dry plate, require a large outlay to keep up stock, and a constant accumulation of useless glass. With collodion, however, the glass is readily cleaned for use again, and the preparation of a plate of any size, from coating to final drying, is only a question of a few minutes.

It has often been a matter of surprise to me that the use of collodion emulsion never attained that importance in general studio work which it undoubtedly deserves. This may be accounted for in part by the fact that the endeavour of experimentalists was directed to its use as a dry process, and comparatively few ever attempted to use it as a wet process without a bath; and its capabilities in this direction will be a surprise to many. Negatives may be produced with great ease and certainty quite equal to any obtained by the bath process, even in its best of working condition, whilst an emulsion when properly made will retain its good working qualities to the last drop, and is in no way liable to the numerous diseases which assail the silver bath. The clear, sparkling brilliancy of a good collodion-emulsion negative would make the photo-mechanical operator's mouth water to look at. In rapidity it is quite equal to wet plate with bath, and can easily be rendered almost as rapid as gelatine when light is bad or time of importance. And again, in the production of copies from drawings, maps, engravings, &c., which may either have become discoloured by age or be coloured by the artist, difficulties thus presented to the ordinary wet-plate process disappear with emulsion, from the facility with which each plate may be rendered colour-sensitive by the use of the numerous sensitisers at command. The whole operations of negative production are thus rendered of the simplest and easiest character, and can be readily mastered by any one who can coat a plate with collodion.

For years past the pages of The British Journal of Photography have contained abundance of instruction in the most minute details of collodion-emulsion making, and at this date it is difficult to write anything on the subject that is absolutely new. The following method, however, the result of many years' constant practice, possesses points of difference to the hitherto published methods, and is specially adapted to reproduction work, on account of the clean and uniform results which are so readily attainable by its use. As I wish to make the whole process simple to those who have not hitherto practised with collodion emulsion, I may, perhaps, be pardoned if I give details which may be familiar to older workers.

First, as to the nature and quality of the materials employed. The most important of these is the pyroxyline; this must be of good quality, or failure will inevitably result. It must dissolve readily without sediment in ether-alcohol, and flow smoothly over the plate. A cotton which dissolves with difficulty, giving, at six grains to the ounce, a thick, ropy solution, renders even coating of the plate an impossibility. Fortunately, there are plenty of good soluble samples to be obtained, and, if care be taken in the purchase, no difficulty will occur in this direction. For the solvents, methylated sulphuric ether, sp. gr. 725, and good commercial methylated alcohol answer perfectly; nor does the recent addition of mineral naphtha to the alcohol affect it disadvantageously. Let both be of good quality, however, and the more highly rectified the better. As to the bromide, I attach considerable importance to the use of cadmium or zinc in preference to any of the alkaline bromides, on account of their ready solubility in alcohol of high specific gravity. In compounding the emulsion, every care should be taken to employ as little water as possible, as each such addition, by lowering the solvent power of the ether and alcohol, increases the difficulty of obtaining even coating of the plate, more especially when large plates are being used.

I will suppose you desire to make twenty ounces of emulsion. Proceed as follows: In a bottle, of at least thirty ounces capacity, place—

Pyroxyline	120 grains,
Ether (methylated)	10 ounces,

and shake till dissolved. In a boiling flask put—

Nitrate of silver	400 grains.
Water	60 to 80 drops.

Put the flask containing the silver into a saucepan of water, and bring it to boiling point, with constant agitation. After a while the whole of the silver will be dissolved. When this takes place, add one ounce of alcohol. It is probable that nearly the whole of the silver will be precipitated, but replace in the hot water, and it will soon again dissolve. Add in this way more alcohol, until you have added ten ounces; then, making sure there is no undissolved silver left at the bottom of the bottle, add this whilst still hot a little at a time to the dissolved pyroxyline. Again the silver will be partly precipitated, but this time in contact with the pyroxyline, and in a fine state of division, so will cause no trouble in emulsifying.

Now weigh out—

Cadmium bromide	300 grains,

and add to the silvered collodion, and immediately commence to shake vigorously until the whole is dissolved. Use no acid of any kind. Of course, the emulsion is now sensitive to light, but will not attain its full sensitiveness for some hours, or it might be a few days. Much depends upon whether the silver was neutral and the ether and cotton were free from acid. Good negatives may be taken with it in a few hours after mixing, but it is not yet in the condition I am recommending in this article. A process of ripening goes on for some time, and, as the emulsion contains a large excess of free silver nitrate without restraining acid, this stage is soon passed, and on trying a plate with it nothing but dense black fog can be obtained, and the tyro would judge the whole lot spoiled. But this is just what is wanted in this method of preparation, and when it is attained the emulsion is ready for the final operation.

Take—

Ammonium bichromate	20 grains.
Water	6 to 8 drops.

Put in a test tube, and dissolve by heat. Add this whilst hot, to prevent crystallising, to the fogged emulsion. A dense crimson precipitate of silver bichrome is at once formed, and the emulsion looks of a brick colour. Now add, with constant shaking, more cadmium bromide, a little at a time and with constant shaking, until the whole of the colour disappears and the silver bichrome is converted into silver bromide. The emulsion is now complete, and possesses several peculiar properties. It is no longer sensitive to light on account of the presence of cadmium bichrome in it, and no precautions are needed to keep it from the light. A long exposure to strong daylight would fog it, but on replacing in the dark room for half an hour it recovers all its good qualities.

The comfort of being able to coat the plate in a good strong light without any fear of fog is undeniable. As I said at the commencement, this emulsion is intended to be used wet, just as ordinary collodion, but without a silver bath. The details of operation, therefore, as to preparation of glass and coating plate differ in no respect from ordinary wet-plate practice. Allow the collodion to set well, then immerse in a dish of clean water, and allow to remain until the ether and alcohol are washed out, and by that time the by-products of cadmium nitrate and bichrome will also dissolve out, and a final rinse with clean water from the tap removes the last trace, and the plate recovers its full sensitiveness, with perfect freedom from fog and other defects common to wet collodion. Exposure is about the same as for wet collodion, but a wide margin is allowable, for it seems almost impossible to fog the shadows, and in development over-exposure is easily remedied.

For development, any of the developers used in the gelatine process may be employed, taking care to add a grain or two more bromide to the ounce. Ferrous oxalate or hydroquinone are, however, the most successful in my hands, about half the strength usually recommended. If for process-work negatives, the addition of one drop per ounce of developer of tincture of iodine, made by dissolving ten grains of iodine in one ounce of alcohol, will assist to keep perfectly clear shadows and get great density. If sufficient intensity is not attained at once, wash off the developer, and proceed to redevelop with the following:—

Nitrate of silver	60 grains.
Water	4 ounces.

Soda sulphite until the precipitated silver sulphite is redissolved, then add citric acid 10 grains.

Of this take one drachm and make up with water to one ounce, add a grain or two of hydroquinone or pyro, and intensity will be obtained without any fear of veiling the shadows; or the ordinary lead or mercury methods may be employed with advantage, if preferred. Silver bromide is not so amenable to redevelopment with ordinary silver nitrate and acid pyro; but, if that method of intensifying is desired, a preliminary wash of potassium iodide, ten grains to the ounce, with just enough iodine to make it of a sherry colour, will convert the bromide into iodide, and then, after washing, the pyro and silver method may be used with perfect results.

The emulsion made by the preceding method will keep indefinitely. I have some over twelve months old in perfect order, and equally as sensitive as when first made. It is a curious fact that the addition of the bichromate after the fogging stage has been reached seems to make a cleaner and more sensitive form of emulsion than if added at any time before. Indeed, if time were an object, I would prefer to hasten fog by the addition of a grain or two of potassium hydrate, or even by exposing the whole batch to light, and then recovering by the bichromate method. But the best method is undoubtedly to let it attain the full stage spontaneously, as described.

In dark weather or bad light the sensitiveness is enormously increased by flowing over the plate, after washing and before exposure, a solution containing two grains of potassium or sodium hydrate to the ounce of water. This acts as a powerful sensitiser, and makes the plate almost as rapid as an ordinary gelatine plate. Should pyro or ferrous oxalate be used as a developer, however, this should be washed off previous to development. To sensitise for colour, a bath of erythrosine or chlorophyll previous to exposure, and the use of a suitable screen will be found of great service.

METHOD OF FIXING PENCIL OR CRAYON WORK ON BROMIDE PRINTS.

If the following is not known or practised, I think that its publication will be of use to those who desire to finish bromide prints or enlargements with pencil or crayon, instead of with Indian ink and gum. The prints having been worked on, fixing is effected by a jet of steam being carefully directed against its surface. The upper surface of gelatine is softened a little under the action of the steam, and the powders are amalgamated with it. It is necessary to watch the operation very carefully, and not allow the action of the steam to be too great. Prints thus prepared resemble crayon or pastel work, and the results are most admirable, even with originals which, before being worked on, are very inferior. I obtain the steam jet very simply; a small kettle with a piece of rubber tube on the spout is all the apparatus necessary. This is partly filled with water, not higher than the lower end of the spout, and put on a gas stove, or kept boiling by any other means. The rubber tube, with a suitable metal nipple to control the steam jet, is then directed against the print, at a distance which experience may dictate.—*Photographic Scraps.*

COPYRIGHT IN PHOTOGRAPHS.

Mr. Ernest J. Richards' notes on this subject will be found reliable and useful.

Prior to the passing of the Fine Arts Copyright Act, 1862, the authors of paintings, drawings, and photographs had, so the preamble sets forth, no copyright in such their works; and, it being deemed expedient that the law should in that respect be amended, an Act was passed which has since remained, without alteration, the statutory basis of artistic copyright. The first section defines such right to be 'the sole and exclusive right of copying, engraving, reproducing, and multiplying, ... such photograph and the negative thereof by any means and in any size'—a definition that certainly seems comprehensive enough; and its duration is limited to the term of the natural life of such author and seven years after his death. It is declared to be personal property, and it devolves and can be dealt with accordingly.

After the Act had come into operation, the first difficulty arose over the question, Who is the 'author' of a photograph? To ascertain the author of a painting or drawing was not difficult, and it was equally easy to do so in the case of a photograph that was wholly the work of one man; but, when a negative was the result of the combined work of perhaps half a dozen people, the question became an exceedingly difficult one to answer. For a long time it was the general custom of the employers to register themselves as the authors; but the Court of Appeal decided, in a comparatively recent case, that they were not necessarily so, and that consequently all such entries were invalid. The author, said the Master of the Rolls, is 'the person who effectively is, as near a he can be, the cause of the picture which is produced—that is, the person who has superintended the arrangement, who has actually formed the picture by putting the people into position, and arranging the place in which the people are to be—the man who is the effective cause of that.' That definition was accepted by the other members of the Court, being put more tersely by Lord Justice Cotton as 'the inventive or master mind,' and it is now the only safe test that can be applied. The Act contains no provisions as to joint authorship, but the Copyright Registry accept entries wherein two or more persons are named as authors. The point as to the duration of the right in such cases has never been decided, but it is believed that it will continue until seven years after the death of the last survivor.

But, even in cases where an employee must be named as the author, the copyright still vests automatically, by operation of law, in the employers, the photograph being made on their behalf for valuable consideration—that is, the salary paid by them to their assistant. Consequently, whenever the copyright in such a photograph is registered, the entry should be of the 'author' as author, and of the employers as proprietors; otherwise it is bad in law and invalid. The copyright in a photograph is irredeemably and for ever lost if, when the negative is *first* sold, there is no agreement in writing reserving the right to either the seller or the purchaser.

There is one exception, however, to the foregoing paragraph that must be noted. If the photograph is taken for a customer who pays for its being taken, then the copyright belongs to him. The negative remains the property of the photographer, and the sitter cannot claim it; but he is entitled, on the ground of implied contract, and apart altogether from his rights under the Copyright Act, to restrain the photographer from printing copies for any purpose, except to the customer's order, and even from exhibiting a copy in his window as a specimen of his skill. If it is desired in such a case (usually termed work done on commission) that the copyright should belong to the photographer, it must be reserved to him by an agreement *in writing*.

The Act further ordered that there should be kept at Stationers' Hall a Register of Copyrights in Paintings, Drawings, and Photographs, and that no one should be entitled to the benefit of that Act in respect of infringements of his copyright unless he was entered on such register as the proprietor thereof. Registration is not necessary to entitle the author of a photograph to copyright therein—that accrues immediately it is completed; but it is absolutely necessary to enable him to recover damages or penalties in respect of the breach of such right, and then only in respect of infringements committed after registration. To be entitled to copyright, one must be a British subject, or resident within the dominions of the Crown. The precise meaning of the latter clause is doubtful, and still without judicial interpretation; but there is an *obiter dictum* of Lord Cranworth to the effect that a foreigner must be resident here at the time of publication, which is the crucial period in the production of a work. Registration can be made at any time, and by the proprietor under an assignment without registration of the original copyright. Having once been made, all subsequent assignments must be registered. The fee payable on first entry is one shilling, and the necessary forms can be obtained at the Copyright Registry.

Turning now to infringements, we find that whoever makes copies of a copyright photograph for sale, hire, exhibition, or distribution (but not for mere personal gratification), is liable to a penalty not exceeding 10*l.* for each copy; and also that a like penalty may be inflicted upon any person who, without the consent of the proprietor, imports from abroad, or sells, publishes, lets on hire, exhibits, or distributes, or offers to sell, &c., or causes to be sold, &c., any copy or reproduction of a copyright photograph, knowing such copy had been unlawfully made. Guilty knowledge, however, is essential to a conviction. These penalties may be recovered before a Court of Summary Jurisdiction, which has power to order imprisonment in default of payment; and, being in the nature of a punishment, the subsequent bankruptcy of the offender affords no release, as in the case of a civil debt. They may also be recovered in the ordinary civil Courts; or, in lieu thereof, damages, and an injunction to restrain the sale, &c., of such fraudulent copies may be claimed; and all Courts have power to order, in addition, the forfeiture of the pirated copies to the complainant. The Act expressly forbids the importation of such unlawful copies, and empowers their seizure by the Custom-house authorities, but it gives no right of entry to search therefor.

All agreements, licences, and consents in connexion with the copyright of photographs must be in writing and duly stamped. A limited licence to reproduce a copyright photograph by any particular process, or in any particular form, need not be registered at the Copyright Registry; and such a licensee can himself maintain an action for damages and an injunction in respect of infringements of his own limited right. A licence to reproduce a photograph in a magazine or illustrated newspaper does not (in the absence of special provision) justify its republication separately, or in book or any other form.

ACETYLENE: A NEW LIGHT FOR PHOTOGRAPHERS.

ACETYLENE is a combination of carbon and hydrogen, many properties of which have for some time been known. From it can be built up all the other hydrocarbons capable of being used for illuminating purposes. For instance, by passing it through a tube heated to just visible redness, it is converted into benzole; at a higher temperature naphthalene (commercially known as albo-carbon) is produced; whilst, by the action of nascent hydrogen upon it, ethylene and ethane can be built up, the former of which is readily convertible into ethyl alcohol by consecutively treating it with sulphuric acid and water. Were a cheap and easy method of preparing acetylene known, it is hardly possible to foresee the results which will ultimately be produced.

This desiderated cheap and easy method has now been discovered, and the number and variety of bodies hitherto produced from coal and hydrocarbon oils which may be obtained from acetylene are altogether staggering. Indeed, it is not saying too much that the production of aniline dyes, of 'coal' gas *cum multis aliis*, may henceforth be considered as capable of being carried out, even if the hour of the predicted cessation of a coal supply in every part of the world had arrived. Nay, if we correctly estimate the prospective value of acetylene, it may prove the means of supplying us with the many alcoholic beverages now in every day or evening use without the aid of the grape or the fermented grain. But it is with it as an illuminating agent that we are for the present concerned.

The means by which the synthesising of hydrocarbons, on a commercial basis, was discovered reads somewhat like a romantic story. It was not the outcome of an elaborate research, having this discovery as its ultimate goal, but was found by chance during the search for quite another object. Premising that it is an American discovery, made by Mr. T. L. Wilson, that gentleman, whilst working with an electric furnace, and endeavouring, by its aid, to form an alloy of calcium from some of its compounds, noticed that a mixture containing lime and powdered anthracite, under the influence of the temperature of the arc, fused down to a heavy, semi-metallic mass, which, having been examined and found not to be the substance sought, was thrown into a bucket of water, with the result that a violent effervescence of the water marked the rapid evolution of a gas, the overwhelming odour of which enforced attention to its presence, and which, on the application of a light, burnt with a smoky but luminous flame. When this phenomenon was investigated, it was found that a mixture of chalk or lime with carbon in any form can, in an electric furnace, be fused with the formation of calcic carbide, and that, on the addition of water to this, a double decomposition takes place, the oxygen of the water combining with the calcium of the calcic carbide, forming lime, whilst the hydrogen unites with the carbon of the calcic carbide, forming acetylene, which is thus produced inexpensively; for, as already stated, *any form* of carbon may be used, while chalk may be had for the picking of it up, thus rendering us, as Professor Lewes continued, practically independent of coal and oil, and placing in our hands the prime factor by which nature, in all probability, produces those great underground storehouses of liquid fuel upon which the world is so largely drawing to-day.

Calcic carbide will, undoubtedly, soon be placed upon the market, probably in the form of rods or cylindrical cartridges; and, to make it yield up the acetylene, all that is necessary is to place a small quantity—say, one pound—of it in a suitable metallic vessel, and allow water to slowly drip upon it, the acetylene then pouring off in a continuous stream, the solid mass in the vessel being converted into slaked lime.

Acetylene is soluble in water, alcohol, and most other liquids. It can be condensed to a liquid by pressure, and this, when sprayed into the air, absorbs so much heat that some of the escaping liquid is converted into a snowlike solid, which, on applying a light to it, burns until it is all converted into gas and is consumed.

When diluted with twelve times its volume of air, it becomes highly explosive, which property ceases to exist if diluted with twenty parts of air. The gas is so intensely rich that it can only be consumed in small flat-flame burners; but, if the consumption is so regulated as to amount to five cubic feet per hour, then its illuminating value is equal to no less than 240 candles. The lecturer gives it as his opinion that, when liquefied for use in the country, a large cylinder of this liquid gas would supply a house with light for a very long period, for, by utilising suitable burners, a consumption of only half a foot an hour would give a light equal to from twenty to twenty-five candles.

We can, in acetylene, perceive a gas that will, at no distant period, prove of the highest value to photographers. Its great intensity will enable them to take portraits by its agency at a most trivial cost for illumination and outfit, while its simplicity and portability, added to the intensity of the light and smallness of the flame, must render it invaluable for lantern projections and the production of enlargements.

Its economic value, too, is a feature worthy of being noted; its cost—compared with that of London gas, which has an illuminating power of sixteen candles, while, as previously stated, the acetylene has an illuminating value of 240 candles, and this at 6*s.* 4½*d.* per 1000 feet—would, in light-giving value, be equivalent to London coal gas at less than 6*d.* per 1000.

At present the whole thing is so new, and, as Mr. Sugg said at the close of the lecture, 'so surprising,' that we have of necessity to take our description from Professor Lewes, but we hope before long to give some of our personal experiences with the light as employed for photographic uses when the commercial side has been more fully matured.

ALUMINIUM.

A PARAGRAPH has been 'going the round' that, in effect, in 1884, but 150 lbs. of this metal were produced in the year, and now the production is 339,000 lbs. annually, the reduction in price being from 35*s.* to 3*s.* 2*d.* per lb. Whether the figures as to the relative production be correct or not, there is no question that the use of this metal has been largely on the increase in photographic apparatus during the past year or two, and is still increasing—notwithstanding that some manufacturers charge much more for the fittings over those of brass.

TO TEST COLLODION FOR METHYLATED SPIRIT.

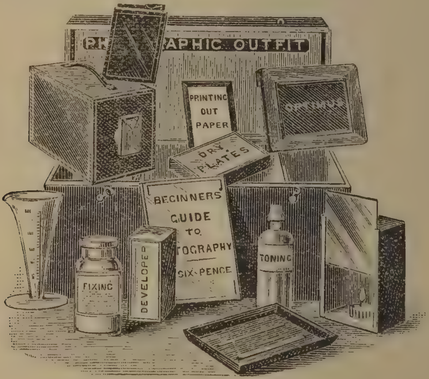
It used always to be considered that collodion made with solvents free from methylated spirit was better, and permitted the bath to remain in working order for a longer time. If it be desired to test collodion as to its freedom from methylated spirit, it may be best done, perhaps, by the nitro-prusside method. Dilute a small sample of the collodion with a little water to throw down the pyroxyline, and then to the clear liquid, obtained by removing the clot, add an equal bulk of a one-per-cent. solution of nitro-prusside of sodium and a few drops of ammonia. If methyl alcohol be present, there will appear, in a quarter of an hour or less, a distinct red colouration. In some collodions the "sensitising" solution is usually where we must look for the cheap spirit to test, for which it will be desirable to distil a small quantity. This can be done readily enough by connecting two test tubes lightly together with a short length of glass tube and cork, and placing a little of the suspected solution in one. Upon immersing this tube in a basin of boiling water, and the other in one of cold, sufficient alcohol for the required purpose will quickly distil and collect in the cold tube. We describe this extemporaneous method for the inexpert rather than one which would involve the use of a naked flame and the risk of an explosion.

A NEW DEVELOPER.

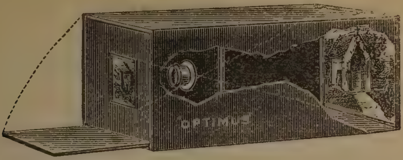
According to M. G. A. LeRoy, it is quite possible to develop a gelatino-bromide or chloride plate by aqueous solution of alkaline peroxides or peroxide of hydrogen solution made strongly alkaline. The results, however, are decidedly inferior to those produced by the ordinary developers, and further the image is much reduced in intensity by hypo solution.

COMPENDIUM OF PHOTOGRAPHER'S INSTRUMENTS.

Under this title Messrs. Perken, Son, & Rayment have grouped the many requisites for taking photographs, displaying them on the screen to friends in the magic lantern, or enlarging them for wall pictures.

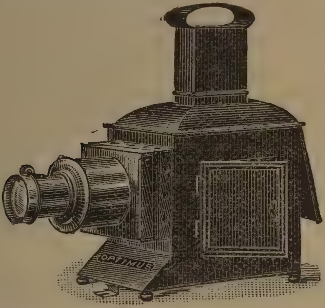


The camera—a natty and well-made one, of the detective or hand type—is fitted with an Optimus lens, which possesses perfect optical qualities and an instantaneous shutter. Though thus adapted for snap-shots, the all-important tripod is remembered for more serious work. Other essentials, including chemicals and accessory apparatus for development and printing, are supplied.



Negatives having been made may be enlarged, on either paper or glass, for window decoration, by means of the ingenious enlarging camera provided for the purpose.

The body of the optical or magic lantern is of metal. It has a three-wick lamp; a condenser, composed of two plano-convex lenses of four inches diameter; and a Petzval photographic front lens.



The *Beginner's Guide to Photography*, enclosed, forms an all-sufficient instructor to the use of these instruments.

Though this is an inexpensive outfit (72*s*.), it is most comprehensive, and, we may add, the efficient quality of its various parts makes the price a marvel.

EXTEMPORISED DRY-PLATE MAKING.

We have not unfrequently been told that it would prove a great boon to many photographers if the dry-plate manufacturers would supply emulsion in either a dried or a gelatinified condition, so as to permit them to coat their own plates occasionally, when from any cause their supply of any odd or special size ran out. Dry plates can now be procured of such excellent quality and at such low prices, that although scarcely any one would now think of making them for himself for use in the regular course of his business—and this whether he is a professional or an amateur—yet the ability to coat a few plates of a size not always readily procurable must prove valuable to many who are at a distance from centres of supply.

There are two methods of treating gelatine emulsion so that it will be in a condition of readiness for applying to a clean glass plate. One of these consists in adding to the liquefied emulsion an antiseptic which will check or prevent decomposition without destroying the sensitiveness. Of these there are several, but it is not easy to determine which possesses the balance of advantages. The presence of a little creosote in a solution of gelatine will prevent decomposition for a protracted period, but it has been found to impair the sensitiveness to some extent.

On one occasion we received a bottle of gelatine emulsion, which was liquefied by heat and applied to the coating of plates. These plates kept good for many months until the last one was used, but what remained of the emulsion left in the bottle underwent putrefactive decomposition in three or four days. Just about the same time a similar bottle was received from a Scotch photographer, who appeared to have foreseen this possibility, for, when it was taken into the dark room and liquefied for the purpose of coating, it was found to smell somewhat strongly of menthol, or one of the family of the mints. This remained quite good for at least a month, or until every drop had been used. The peppermint here had proved itself to be an antiseptic.

The late Colonel Stuart Wortley once gave us some plates which he had coated with emulsion he had prepared about six weeks previously, the antiseptic in which was thymol, which we understood to have been made by digesting ordinary garden thyme with alcohol. He gave it as his opinion that he could coat plates with it after another month which would be quite good.

It was Mr. Richard Kennett who grasped the real principle of making an emulsion which should keep good for years if necessary. He seemed to have realised that, in order to make it keep for an indefinite period, it should be entirely desiccated; and, after a time devoted to experimenting, he in 1873 obtained a patent for the result of his ingenuity. He was intimately conversant with the possibilities of gelatine emulsion, and at that time did not foresee the manufacturing businesses that were ultimately to arise out of the dethronement of collodion by gelatine, for, in those days, each photographer made his own plates. His aim was to put it in the power of the photographer to make his plates with a minimum of trouble. Every one then was believed to be able to make gelatine emulsion, fast or slow, as suited his requirements. What was wanted was an emulsion which, when made and found to be good, could be used according to the requirement of the user. The emulsion, having been made and tested, was, by Kennett's patent, thoroughly dried, cut up into small strips or filaments, which were weighed out and packed into light-tight packets, each requiring the addition of so much water to render it in a condition for being used, and which quantity was printed on the outside of the packet. To give some idea of the method of using this, we may state that, two or three years after receiving a small packet of desiccated emulsion from Mr. Kennett, we saw from the label that it was for two ounces of water. This we added, and allowed it to stand until the pellicle had absorbed it, after which it was liquefied by immersing the bottle containing it in warm water. A dozen of plates, previously cleaned, were then coated and dried. These ultimately, when exposed and developed, gave negatives with which no fault could be found, either as regards sensitiveness or quality of image. So far as could be seen, there was no reason why, if carefully put up, this desiccated pellicle might not have been kept for a much longer period.

Now, what we appeal for to our emulsion-making friends is that they should afford to *dilettanti* photographers the means by which they might coat an occasional plate, each for himself when occasion, or even whim, so desired it. If it were known that on certain dates emulsion in small quantities would be sent out at not unreasonable prices, it is probable many would avail themselves of the opportunity of making purchases of it, even if they should never use it. It might either be placed on the market in the jellified form, or be desiccated in the form of thick pellicles which the user could cut up and liquefy for himself.

There is no insuperable difficulty now, any more than in an earlier period, of each making his own emulsion by any of the innumerable formulæ which were at one time so plentifully distributed throughout the journals; but, as photographic human nature is constituted at present, one would much rather pay even a good price for any commodity of this nature, made by a competent manufacturer, than put himself to the trouble of doing so himself.

Collodion emulsion occupies a totally different place from gelatine. It keeps for an indefinite time after being made, and is always in a fluid form; moreover, it dries immediately that the plate is coated; but, for negative work, dried collodion lacks the sensitiveness of dried gelatine, and is much more delicate to handle, although we quite grant that exquisite pictures may be made by its agency.

If we understand photographers aright, some of them are quite willing to pay a proportionately higher price to those who will enable them to prepare an occasional plate for themselves, and on their behalf we make this appeal.

PHOTO-MECHANICAL PRINTING.

A PATENT has been obtained by the *Chemische Fabrik auf actien vormals E. Schering* which relates to a method of preparing a sensitised film which will give a positive direct or a negative suitable for photo-mechanical printing. The sensitive film contains gelatine, formic aldehyde, and a salt, such as ferric chloride, which is reduced by the action of light. The formic aldehyde, which renders gelatine insoluble, is oxidised to formic acid where the light impinges and leaves the film soluble in these parts. The positive is then developed by warm water. To produce a negative, formalin sulphite is added to the gelatine and reducible salt. When the light acts, the sulphurous acid is oxidised and sets the formalin free so that it can combine with the gelatine and render it nsoluble. These negatives are suitable for photo-mechanical printing.

EXPERIMENTS WITH FORMALIN: WASHING NEGATIVES WITH BOILING WATER.

THE special value claimed for formalin or formic aldehyde in relation to photography lies in the fact that by applying it to a wet gelatine negative, whether such gelatine be made upon a glass, celluloid, or paper support, it is immediately rendered insoluble, even in boiling water and other menstrua in which it was formerly soluble.

It is from a conviction that formalin is destined to become of considerable usefulness in photographic practice that we recommend those readers of an experimental turn of mind to subject it to trial, and note its action upon gelatine, at varying lengths of time and under differing conditions of strength.

We premise that formalin or formaldehyde, although we have not yet seen it quoted in the price-lists of photographic dealers, can now readily be obtained at 2*s*. 6*d*. per pound. Formalin is a clear liquid, and is a forty per cent. solution of formic aldehyde, which, at ordinary temperature, is a gas. Its action upon gelatine is a very powerful one. When we commenced experimenting with it, we had formed the intention of noting its actions under varying degrees of dilution, so as to be enabled to deduce reliable formulæ from a number of trials. Our first attempts were made with a solution somewhat stronger than two drachms of formalin to the ounce. In reality, the proportion was two drachms of the formalin placed in a graduate, and water added to bring it up to one ounce. A negative was then taken out of the fixing bath, and, having received twenty minutes' washing, was transferred to the diluted formalin bath, in which it was allowed to remain with frequent agitation—such agitation as a negative receives when undergoing development—for two and a half minutes. It was then removed, and subjected, for about one minute, to a spray of water to assimilate its surface to the water, for at first, when taken from the formalin solution, the surface had a kind of repellent appearance over which the water ran as if it were greasy. The sympathy between the surface and the water was fully established in less than a minute under the spray. Having a kettleful of boiling water standing on a Bunsen stove conveniently at hand, we then deluged the plate with the boiling water, in which we allowed it to remain for a few seconds, finishing up with another boiling douche. The heat of the plate was now such that the gelatine coating was rendered quite dry in much less than half a minute, and the surface, when dry, was very hard and strong.

Some changes were now rung upon the method of proceeding. First of all, the dilution of the formalin was carried to a much greater extent. Having found that insolubility was produced by two drachms of the formalin to six of water, we now reduced its strength in the proportion of one drachm to seven of water. After fixing a negative, we did not give it a complete washing as before, but merely subjected it to a very slight rinsing, just so much as would have prevented the hyposulphite from crystallising out on the surface had the plate then been dried. The negative was then immersed in the diluted formalin, as in the previously mentioned experiment, after which it was treated with hot water, followed with a copious douche of boiling water. We had purposely left the negative unwashed after fixing, except by the slight rinsing spoken of, our intention being to ascertain whether the hyposulphite would not be as quickly eliminated from the film by the copious application of the boiling water for a brief period as by the prolonged application of cold water, as done in every-day practice.

We have long been familiar with the fact that, when washing either a negative or a positive in a collodion or albumen pellicle with hot water, the fixing salt can be removed in a very brief period indeed; and, notwithstanding that a gelatine film, from its greater thickness and sponginess when wet, lends itself more easily than either collodion or albumen to the retention of saline matter, we also trusted to the powers of hot water, applied with some degree of force to the gelatine surface, to penetrate its porous body, and eject everything that was soluble in an aqueous menstruum. The test we applied for the efficiency of this simple and quick means of removing the hyposulphite may not be the very best in strict chemical qualitative analyses, but long experience has proved it to be quite good in photography. We refer to the starch and iodine test.

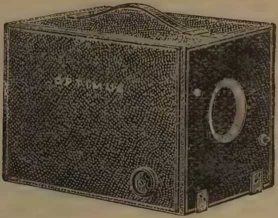
Experienced photographic chemists need not be told either how to make or to use iodide of starch as a test for hyposulphite; but, as some may read this article who are not aware of it, we will tell them how we made and applied it in the experiment just described. Having boiled a little starch in distilled water, add to it two or more drops of tincture of iodine, which will turn the starch solution into an intensely blue colour. Now catch some drops of the water by which the plates were last washed, and add to it one or more drops of the blue starch solution; and, if the blue colour is discharged, it indicates the presence of hyposulphite in the water. If, on the contrary, the blue colour remains, it proves the absence of the fixing salt.

Several experiments with formalin are pending which, when completed, will, we hope, enable us to give formulæ for the more useful applications of this substance. Among these are the conditions under which plates may be treated previous to exposure in the camera, so as to render possible the application of warm developers, or even of developers warmed up to the normal temperature of tropical countries.

Having had some experience in developing plates in a country in which the atmospheric temperature very far exceeds what has ever been known in land, we, and every one who has had similar experience, will welcome every expedient which will prevent the gelatine film from liquefying and running over the surface of the glass plate, during either development or drying.

'OPTIMUS' IMPROVED UBIQUE CAMERA.

The instrument sold under this name during the last three seasons has met with very decided success. The makers have, therefore, to further encourage its sale, greatly improved the model: firstly, by fitting a rack-and-pinion adjustment for focussing, actuated from the outside of the instrument; secondly, by supplying a roller-blind shutter with it. The three double dark slides and focussing screen are enclosed within the instrument, so that it is self-contained. It has the necessary threaded nuts to receive screw for attachment to a tripod top, or it may be used in the hand for instantaneous snapshots. It is left to the option of the purchaser to decide whether a single-view, a rapid rectilinear, or an extra rapid euryscope lens be fitted; in either case the price of the complete apparatus is extremely moderate.



The external dimensions are $4\frac{3}{8} \times 5\frac{3}{8} \times 8\frac{3}{8}$ inches, and the black outside leather with which it is covered is really of good quality.

ALUMINIUM A PRECIPITANT FOR GOLD AND SILVER FROM THEIR SOLUTIONS.

M. **Silas**, in the *Paris Photographie*, says that aluminium offers an excellent means for recovering gold and silver from waste solutions. The particular solution is, first of all, made acid with hydrochloric acid, and then a strip of aluminium is introduced. The gold precipitates as a brown powder; the silver is thrown down as chloride.

DUST.

Cosmos says: Dust is the photographer's greatest enemy. It is omnipresent. I am not going to dilate upon its wonderful property of defying the most studious care of the photographer to avoid it, or dwell upon the havoc it works on his negatives and prints; for is not all this written in former volumes of the Journal (q.v.)? I will, however, give my readers a hint which may be worth noting as regards dusting their plates preparatory to placing them in the slides: It is, not to use a brush or any similar implement for dusting the surface of the sensitive film, but simply to knock the plate at one corner rather smartly on the table or bench. This will disengage any temporarily adhering particles. A practical friend of mine, and a clever photographer, with whom I was changing plates a few weeks back, told me that by the adoption of this trifling and untroublesome precaution his negatives were always freed of dust spots.

NEW PHOTO-THEODOLITE.

THIS is described by Herr O. New in a foreign scientific journal. Its great feature is a geometrical clamp, which enables the surveyors to use and fix alternatively camera or telescope on the stand with rigid geometrically accurate centering. The clamp is of hard steel, in which are formed a hole, a slot, and a plane. In these fit the three spherical feet of camera or telescope. An arrangement for securing accurate placing of the plate forms also part of the design. The instrument is almost wholly of aluminium, and should be a valuable surveying tool.

MARIONA.

THIS paper may be toned with any of the usual baths, but the following are recommended:—

PLATINUM TONING.

A.—Stock Solution.

Potassium chloro-platinite	15 grains.
Water	15 ounces.

B.—Stock Solution.

Citric acid	160 grains.
Chloride of sodium	160 ,,
Water	8 ounces.

Take 2 ounces from A and 1 ounce from B, and make up to 1 pint with water. This is sufficient for toning two sheets.

The following bath may also be used for platinum toning:—

A.—Stock Solution.

Potassium chloro-platinite	15 grains.
Water	15 ounces.

B.—Stock Solution.

Chloride of sodium	160 grains.
Chrome alum (1 per cent. solution)	8 ounces.

Take 2 ounces from A and 1 ounce from B, and make up to 1 pint with water. This is sufficient for toning two sheets. When this bath is used, it is not necessary to wash prints before toning; the alum bath can also be omitted

GOLD TONING.

Carbonate Bath.

A.

Stock solution of gold	15 grain tube.
Water	15 ounces.

B.

Sodium carbonate (common washing soda)	30 grains.
Water	15 ounces.

Take 2½ ounces of each A and B, and make up to 1 pint. This should tone about two and a half sheets of paper. To be thoroughly washed in several changes of water, then placed in the fixing bath. Dissolve 3 ounces of hypo in 1 pint of water. Keep the prints moving for at least ten minutes. The final washing must be in running water, or several changes of water, for at least two hours

Alum Bath.—In warm weather or hot climates it is advisable to use this bath before toning; strength about 10 per cent., or chrome alum 1 per cent., for ten minutes, prints being again thoroughly washed before toning.

Partial Development.—This method will be found very convenient in dull weather, or even at night, by magnesium or electric light. Print till the image is fairly visible, then immerse, without washing, in a 10 per cent. solution of potassium bromide for four or five minutes. Then, after thoroughly washing for a few minutes, place the print in the following developer, mixed in equal proportions:—

A.

Hydroquinone	80 grains.
Sodium sulphite	320 ,,

Make up to 1 pint with distilled water.

B.

Sodium carbonate	400 grains.
Ammonium carbonate	400 ,,
Ammonium bromide	40 ,,

Make up to 1 pint with distilled water.

Continue the development until all but the faintest details are visible, then immediately wash the print thoroughly in running water, to remove entirely the developer before placing it in the toning bath. All after-treatment will be the same as given above for printed-out prints.

ASTRONOMICAL PHOTOGRAPHS WITHOUT A DRIVING CLOCK.

Mr. Joseph Lunt, B.Sc., F.C.S., at a meeting of the British Astronomical Association, described how he had obtained excellent stellar photographs without going to the expense of a driving clock, or even a slow-motion rod or tangent screw, only a gentle hand pressure being applied to the baseboard of the telescopic camera. The principle of the plan he advocated was the placing the star image (in the second or guiding telescope) much out of focus, so that it formed a visible disc. This being thrown on the intersection of the cross lines of the telescope, he found that he detected the slightest variation in size of the quadrants the out-of-focus image was divided into, and so enabled him to keep the photographic image central. The results he showed were considered admirable, and were a high tribute to his skill and care, for they embraced plates which had received exposures of half-hour and hour. Isochromatic plates were used, and a lens made by Hilger of two specially selected Jena glasses only, which had been found to give a maximum visual excellence with a special adaptability to photography.

THE INVENTION OF EMULSION PHOTOGRAPHY.

The true inception of emulsion photography does not appear to be quite so well known, especially to contributors to some Liverpool journals, as would be desirable in the interests of historical accuracy.

From a provincial paper recently received, in which the lamented death of B. J. Sayce is commented on, the writer evidently believes that emulsion photography was unknown prior to the publication of the experiments of Sayce and Bolton in 1864, and dreams are indulged in as to the fortune that might have accrued had a patent been taken for the discovery, instead of its having been given as a present to the world.

The emulsification of the sensitive ingredients was, doubtless, a natural, as it has proved a useful, idea, but it would not have formed a subject for a patent—at any rate, not at the time of the Sayce and Bolton introduction of it—and this for the good and sufficient reason that a patent for emulsion photography had already been applied for by another three years anterior.

It was in 1861 that Captain Henry Dixon, having conceived the same idea, obtained provisional protection for what was entitled "Improvements in Photography," these improvements consisting in mixing together in collodion those ingredients which go towards the making of a negative. Dixon's invention as specified, consisted in mixing nitrate of silver with previously iodised collodion or other coating medium prepared in the usual manner. He stated that the mode ordinarily practised for coating plates with collodion or other coating medium had been, first, to pour the prepared (bromo-iodised) collodion on the plate, and then to immerse it in a nitrate of silver bath to coat it with silver. But in this invention the silver bath is dispensed with by mixing the silver with the collodion or other coating medium, so that, after coating the plate with this mixture, all that is necessary is to rinse the plate to remove 'greasiness,' after which it is ready for exposure. By this invention, said Captain Dixon, the numerous objections attending the use of a nitrate of silver bath are entirely dispensed with, and the process rendered more certain, convenient, and considerably less expensive than heretofore.

In the face of this publication it will be seen that it would have been difficult for the gentlemen, afterwards accredited with the introduction of emulsion photography, to obtain a patent for such introduction had they been disposed to have applied for the same. From the fact that Captain Dixon allowed his patent to lapse, we imagine one of two things; he either did not succeed to his satisfaction in carrying it out, or, having thus established his priority of invention, he at once presented his idea to the public as a basis for further improving upon the invention. That others subsequently did improve upon it, the experiments and improved formulæ of Sayce and Bolton attest.

Whether arising from the Dixon idea or not we cannot tell, but it is certain that M. Alexis Gaudin, of *La Lumière*, in or about 1863, wrote that he had invented two kinds of emulsions, which he termed 'photogènes,' one of which he applied to glass by which to take negatives, and the other to paper for positive printing. This latter, we may observe, is the collodio-chloride emulsion of the present period. Soon after its invention by Gaudin, the late Mr. Wharton Simpson read a paper on it at the Photographic Society, and, by thus publicly introducing it into England, was accredited with being its inventor.

From the foregoing it will be seen how difficult it would have been rendered to sustain any patent for the later application of Messrs. Sayce and Bolton.

Gelatine is a recognisably different substance from collodion, and we are not aware of any one having sought to obtain a patent for its application as, what Captain Dixon calls, a coating medium; but, had such an application been made, there seems little doubt that Dixon's previous publication would have seriously interfered with the even tenor of its way.

It need scarcely be said that these remarks are not made for the sake of detracting in the very slightest degree from the merit we have invariably bestowed upon the introducers of collodio-bromide, and which they so well deserve from their patient experimenting and skill in having brought the process into a state more satisfactory and workable than any emulsion process which preceded it.

'OPTIMUS' BRILLIANT VIEW-FINDER.

This little instrument has front lens, mirror, and a second lens of particular construction upon which the image finally falls, which image is presented to the eye with great brilliancy even in the brightest sunshine. The price being very moderate indeed, we conclude a large demand will arise for this useful little adjunct to the photographer's outfit.

NEW PATHS IN PHOTO-MICROGRAPHY.

In certain paths of microscopic research, notably in working upon Virchow's theory of cellular pathology, the value of the results obtained is greatly influenced by the personal equations of the observers. To eliminate this element, Dr. C. L. Leonard, at the Philadelphia Academy of Natural Sciences, recently described a method he had devised, which consists simply in taking a series of consecutive instantaneous photo-micrographs of the moving and changing objects. Thus, incontestable proofs of phenomena are obtained, the changes taking place in the entire field of view can be observed and registered, and the series of observations may be extended for a protracted period. There seems every reason to believe that Dr. Leonard's plan will open out new fields of work, and lead to valuable acquisitions of knowledge.

COLLODIO-CHLORIDE FOR TRANSPARENCIES.

The process is thus described by Mr. J. S. Teape, who has produced most beautiful results by its aid :—

In thinking of a subject to give our Hon. Secretary for his list for the year, I remembered some rather promising results which I obtained about thirteen years ago with collodio-chloride by development. This resulted in me giving him the title which heads this paper, and was given with the view of further experiment, and the chance of obtaining some more perfect results than I did at the time I mention. During this thirteen years I had not touched the process, and it appears to have been almost forgotten. So far as I can remember, the development of an image upon chloride of silver was considered almost impossible previous to the announcement of Dr. Eder, in the early part of 1881. The experiments by Dr. Eder were, I believe, entirely with gelatine. This is very different to collodion, as it restrains the action of the developer, and allows the image to appear before the silver is reduced where no light has acted.

A short time after this, in April 1881, in the *Photographic News*, the late Mr. H. B. Berkeley says, in a letter, 'Collodion will not answer at all—I used both soluble bromide and chloride as restrainers.' This statement from Mr. Berkeley is enough to prevent any one from touching the process. In the *Photographic News*, Oct. 21, 1881, Captain Abney gives a formula for collodio-chloride. This is the process which I started with at the time I have mentioned. A beer preservative is to be used, and the plates developed with Abney's ferrous-citro-oxalate, or hydroquinone. The colour, Captain Abney says, is ivory black. With this emulsion I could not get beyond a cold grey and a good amount of fog. Abney remarks that the ferrous-citro-oxalate can be used without any restrainer. I tried increasing quantities up to three grains per drachm with same result. I also tried addition of four drops of a twenty-grain solution to the emulsion with no better result. I made several quantities of this emulsion, always with the same result. Captain Abney, remarking upon what is usually called collodio-chloride, says it is 'misleading to call it collodio-chloride, as it contains a large proportion of citrate in its composition.' This remark is quite applicable at the present time, for I do not suppose that any of the so-called chloride papers or plates are simply chloride.

When I took up the matter again, about three months ago, my experience with Abney's emulsion was the same as described. I expected, by practice with it and variations with other developers to have succeeded, but I was disappointed. I then worked with a process described in The British Journal of Photography, November 20, 1891. I may just say that I do not remember hearing anything of the process for the ten years between.

I worked with this for some time, and got fair density and some good colour, but I used ferrous-citro-oxalate, hydroquinone, pyro, amidol, metol, and glycin, in various proportions, and with increasing quantities of bromide. I also tried the addition of quantities of citrate of potash; this seemed to improve matters a bit. The image with the best-proportioned developers came up gently enough —but the fog as gently with it. I tried four samples of pyroxyline. I began to feel disheartened, and expected to have nothing but failures to describe to you in this paper. I am pleased to say this is not the case. A week ago this evening, I arranged the following formula, which has proved to be a complete success in my hands:—

Pyroxyline (Hopkin & Williams' ordinary)	32	grains.
Ether (725)	3¼	ounces.
Alcohol (805)	2½	,,
Chloride of zinc	40	grains.
Nitrate of silver	92	,,

Dissolve the chloride of zinc in the alcohol (and this is a valuable quality of chloride of zinc, that it will dissolve in the alcohol without the addition of water), put in the pyroxyline when soaked, add the ether and shake. Now put the silver into a test tube, add forty minims of distilled water. At this stage I prefer to use a non-actinic light. A single thickness of amber glass will do. There is no necessity for working in a dull light. We now dissolve the silver by heat over a spirit-lamp flame, and at the same time heat six drachms of alcohol in a small flask; when the silver is dissolved add about a drachm of hot alcohol to it by degrees. Then add to your collodion, a drop or two at the time, and shake well between, rinse out the tube with the remaining alcohol. If the operations have been carried out properly, a few drops of the emulsion put upon a plate will show an orange tinge, a fairly thick film, a full orange inclined to ruby when held up to a light. The emulsion must be kept for not less than twenty-four hours.

This emulsion may be washed in the ordinary way. I use it without washing as a rule, as washing entails the consumption of twice the quantity of solvents. To filter, place a plug of wool or good sponge in a glass funnel, and run the emulsion through. Moisten sponge or wool with a few drops of alcohol first.

Coat the plates, and place them in a dish of water until the water runs smoothly over the surface, then rinse with two changes of water. Wipe the backs, and drain on blotting-paper; or, when plates are wanted quickly, a piece of blotting-paper may be placed on face of the plates, and gently pass a finger over to absorb all surface water. After this, they dry in five to ten minutes by the use of such a piece of apparatus as I show you. The usual drying cupboard will do, of course.

With this emulsion no preservative is at all necessary. I have found no difference in the results. One thing I have forgotten to mention in the proper place, that is, the use of a substratum to prevent the film slipping off the plate during washing. I strongly recommend edging the plates with indiarubber solution. This is quickly done with a small camel's-hair brush cut to about a quarter of an inch long in the hair. A dozen of lantern plates can be done in five minutes easily.

The results which I show you have been developed with Abney's

Ferrous-citro-oxalate	1	part.
Ten per cent. bromide potassium solution	1	,,

Glycin I have only tried one formula given by the makers, that for hard development; and hydroquinone, as follows:—

Hydroquinone	4	grains.
Bromide potassium	24	,,
Sulphide of soda	48	,,
Water	1	ounce.

Three minims of a ten per cent. solution of carbonate of soda.

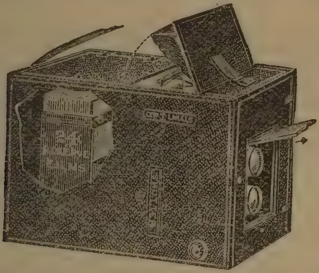
Development was from five to twelve minutes. All these developers may be used repeatedly. Hypo must be used for fixing; two ounces to the pint is strong enough. Washing in the hand for about a minute is enough to remove the fixing salt.

The light used by me was magnesium, 6 to 36 inches. The colours are black, claret, and most beautiful purples to purple black.

And these I must ask you especially to notice are produced by simple development with simple collodio-chloride emulsion.

'OPTIMUS' MAGAZINE TWIN-LENS CAMERA.

Twenty-four films on celluloid. No dark slides. Full-sized facsimile view during exposure. Films changed by turning a button. Films do not require notching or cutting. Rack and pinion for exact adjustment of focus, so ensuring sharply defined pictures. This is what the Company say, and they add: No sticking of the films need be apprehended. Each film is connected to a stiff backing, and is placed in a separate grooved compartment. When the milled head is revolved, the film and backing glide down from the upper to the lower chamber, in which exposure takes place. No intricate mechanism complicates the movements; simplicity of construction ensures satisfactory working. And all this for fifteen guineas. On examination of the apparatus, we believe that they are not overstating matters by a good deal.



LLOYD'S HALF-TONE ENAMEL PROCESS FOR COPPER.

Mr. H. J. Lloyd (*Wilson's Magazine*), Wyalusing, Pa., whose half-tone productions are frequently seen in our pages, contributes the following process, which he believes to be unlike any of the published formulæ, and, so far as his knowledge goes, has not been used by any other engraver. It is as follows:—

No. 1.

Le Page's glue	3	ounces.
Albumen	1	ounce.
Water	4	ounces.
Bichromate of ammonium	80	grains.

No. 2.

Gum acacia	½	ounce.
Water	8	ounces.
Aqua ammonia	2	drachms.

Mix, use three parts of No. 1 with one part of No. 2.

A NEW POWERFUL REDUCING AGENT.

At the British Association meeting, a paper possessing strong photographic interest was read by Mr. H. J. Horseman Fenton, M.A. By the mutual action, under certain conditions, of tartaric acid and a ferrous salt, a substance is produced which acts as a powerful reducing agent (and which gives a beautiful violet colour with ferric salts). The substance, after great difficulties surmounted, has been isolated, and proves to be a new acid. If moist ferrous tartrate be exposed to the air for a short time, a certain quantity of the new acid is produced, and may be indicated by the production of the violet colour above mentioned. The effect is much more intense if the exposure be made out of doors. At first this effect was set down to the action of some constituent of air, but later experiments showed light to be the active factor in bringing about the change. That oxygen, or some oxidising agent, however, is essential, is proved by the fact that even in bright sunlight exposure in a vacuum produces no result. There is thus seen the germ of a new developer, and a new light-sensitive agent.

THE 'FRAM' DARK SLIDES FOR CUT FILMS.

These slides are made both double and single. They are to be obtained from Messrs. Watson & Sons, 313 High Holborn, Messrs. Ross & Co., 111 New Bond Street, W., and Messrs. Hinton & Co., 38 Bedford Street, Strand, W.C., and are the invention of Mr. C. P. MacCarthy. The advantage of the slides is that they hold cut films very firmly round all four sides, and flat and rigid, and that carriers are dispensed with. They have no loose parts. All users of cut films know the trouble caused by carriers either not fitting the films (which are seldom cut accurately) or by the carriers not fitting the slides; and most users of cut films know the trouble, similar in nature, caused by films of different makers not fitting the grooves of ordinary film slides. The Fram slide does away with this difficulty, allows for slight variations in the sizes of the cut films, and yet holds and supports the film very rigidly, by means of a hinged board with a snap catch. The grooves all round, inside, in both, render them secure against light getting in, and it is a great advantage, in the dark room, to have no loose parts to mislay, no cardboard to get wet or frayed or lost, no zinc partition to get bent or dented. The Fram will be found very convenient for travelling, and for refilling in perfect darkness or in a bag where space is limited.

Mr. MacCarthy has submitted to us both models of the single and double Fram slides. The single one has a hinged back, and, the film being laid in position, the slide is closed and the film thus held at all four sides. A solid partition divides the two halves of the double slide, which is equally as effective as the single,

The Fram slide is a step in the right direction, and is sure to be appreciated by users of cut films.

THE KINEMATOGRAPH,

The problem solved by Edison's kinetoscope has been successfully attacked along a different line by MM. A. and L. Lumière. The film, which in the kinetoscope takes the impressions of moving objects, is passed before the eye with a continuous motion, and it is only illuminated for about a 7000th of a second at the instant at which each successive picture is fully in view. Hence, says *Nature*, the total illumination is exceedingly feeble. A very bright object is necessary; the eye has to be brought close to the moving film, and the number of impressions per second must be at least thirty in order to give continuity. MM. Lumière's 'kinematograph,' which is not subjected to these disadvantages, is described in the *Revue Générale des Sciences*. The principal features of this instrument are a mechanism whereby the film is at rest during illumination, and an arrangement for projecting the images upon a screen so as to be visible to a large meeting. Under these circumstances, fifteen images per second are all that is necessary. The film is at rest for two-thirds of the time of passage of each image. During the remaining third the film is grasped and pulled forward as far as the next image by a set of teeth attached to a frame whose motion is governed by a cam worked by a revolving handle. The same apparatus also serves as a camera for taking the photographs, and for printing transparencies from the negative film. For this purpose two films are passed over the rollers, the negative and the film to be printed on, and exposure is made for a very short time as each negative image is placed in the field. An exhibition was given on July 11 at the offices of the *Revue Générale des Sciences*, at which the evolutions of cuirassiers, a house on fire, a factory, street scenes, and a dinner party were shown on the screen, and were much admired.

A NEW USE FOR NITRATE OF SILVER.

It is not often that our readers possess such a surplus of this valuable chemical that they are desirous of finding fresh outlets for its employment, but an exceedingly interesting use for it was described in a lecture at the Imperial Institute by Mr. H. A. Miers. The double nitrate of silver and thallium when melted (which can readily be done at a temperature far below boiling) has a higher specific gravity than any other liquid known. It is as clear as water, and is five times as heavy. It is invaluable for testing the specific gravity of small solid objects, such, for instance, as valuable gems, for it can be mixed with hot water in any proportion, and so brought to any required gravity, and the object to be tested by floating or sinking will at once show its place in the scale of gems.

PREPARING PLATINOUS SALTS FOR PHOTOGRAPHIC USE.

Having described various methods of accomplishing this end, Mr. J. Vincent Elsden says:—

In my own practice neither of these methods prove so suitable, considering the limited appliances of an ordinary photographic laboratory, as Thomsen's plan of reduction by cuprous chloride, which I now proceed to describe in detail. In the first place, the preparation of cuprous chloride in bulk is a perfectly simple operation by the following process:—One part of common salt is added to two and one-eighth parts of copper sulphate, and the mixture is dissolved in water and placed in a narrow-necked bottle provided with a cork. Into a boiling flask a few pieces of charcoal are now placed, and enough sulphuric acid to cover them. This flask is provided with a cork, into which is fitted a bent glass tube, having one branch long enough to reach to the bottom of the bottle containing the copper solution. When placed in position, heat is applied to the flask until a steady stream of sulphur dioxide gas passes through the copper solution. After a few minutes, a shining white precipitate of cuprous chloride begins to fall, and soon accumulates in a thick layer at the bottom of the bottle. The reactions are as follows:—The mixture of salt and copper sulphate produces cupric chloride,

$$2NaCl + CuSO_4 = CuCl_2 + Na_2SO_4$$

The cupric chloride is then reduced to cuprous chloride by the sulphur dioxide, thus:—

$$2CuCl_2 + H_2SO_3 + H_2O = Cu_2Cl_2 + H_2SO_4 + 2HCl$$

It is well, after passing the sulphur dioxide gas for some time, to remove the flask and cork up the bottle for some hours to enable the cuprous chloride to settle thoroughly to the bottom. It can then be washed by decantation with a little dilute sulphurous acid, and, finally, with glacial acetic acid, if required pure. For the present purpose, however, slight traces of cupric chloride will not be prejudicial, and extra care in washing is quite unnecessary.

We now pass to the reduction of the platinic salt by means of the cuprous chloride thus prepared. The yellow, insoluble potassium chloro-platinate, K_2PtCl_6, is made into a thick paste with water, and warmed in a dish over a water bath. Moist cuprous chloride is now added little by little, with constant stirring, until nearly all the platinum salt is dissolved; but the process should not be carried so far as to decompose quite all the platinum salt. For complete conversion, 100 parts of platinic salt require 40 parts of cuprous chloride. The liquid at this stage is nearly black, and so concentrated that it is advisable to filter rapidly before crystallisation begins. After filtering, crystallisation is complete in a few hours. The crystals are now washed with alcohol, redissolved in water, and recrystallised, when fine, large, rose-coloured needles of great purity and beauty are obtained, from which solutions of any required strength may be made.

Carey Lea objects to this process on account of a liability to a reverse action, by which the platinous salt is reconverted into platinic salt at the expense of the cupric chloride present. The ordinary process of conversion described above is a simple reduction by cuprous chloride, thus:—

$$Cu_2Cl_2 + K_2PtCl_6 = 2CuCl_2 + K_2PtCl_4.$$

The reverse action may take place if the solution is made too hot,* and also if too much cuprous salt is added; but, if care is taken to avoid these two excesses, it is not difficult to obtain very nearly the theoretical quantity of platinous salt. In the case cited by Carey Lea, half a litre ot mother liquor was set aside for spontaneous evaporation, and after several days the red platinous salt, which first formed, was found to have relapsed entirely into the platinic condition. If, instead of so large a bulk of solution, a paste only is operated upon, as described above, instead of a day, a few hours only will furnish the crystals of platinous salt without any danger of reversion.

In order that the experimenter may test the result of this method, it must be remembered that 100 parts of metallic platinum will give nearly 249 parts of potassium chloro-platinate, and this should yield nearly 213 parts of potassium chloro-platinite. Of course, the actual amount will be rather less than this if the precaution recommended above is adhered to, and the process stopped just short of complete conversion.

HOW TO USE A LANTERN.

At a meeting of the Southsea Amateur Photographic Society, Major Wilkinson explained to the members present the construction of the optical lantern and the different steps to be taken in preparing it for an entertainment. He prefaced his remarks by saying that the instructions he had prepared, and which are given below, applied only to his own lantern, and that, in using others of different patterns, some modifications would be necessary. It is probable, however, that his instructions will apply, without any change, to a large number now in use, and that, in cases where a different procedure is necessary, slight alterations in some of them would be sufficient to suit them to any particular lantern. It is in the hope that the following notes will form the basis of a code that will prove useful to many that the details prepared by Major Wilkinson are given below. An experienced lanternist has since revised the instructions and suggested several amendments, which have been adopted.

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* Thomsen, *Journal für praktische Chemie* [2], xv. p. 294.

Major Wilkinson's lantern is a single one, fitted with the limelight. He uses gas compressed in the ordinary cylinders, and never dispenses with the regulators.

DIRECTIONS FOR USE.

Cylinders.

1. As soon as unpacked, tighten valve glands by spanners, otherwise they are liable to leak when gas is turned on.

2. Fix regulators and tubing. Red regulators and red tubing; red regulator and red tubing to hydrogen cylinder (painted red), with a left-handed screw, and black regulator and drab tubing to oxygen cylinder (painted black). Never interchange tubing. What has once been used for hydrogen (coal gas) should not be used for oxygen, and *vice versâ.*

Lantern.

3. Fix lantern on top of box, with spare screw inside lid, and fix rose or other top on dome. (If an oil lantern is in use, extend chimney before fixing to lamp.)

4. Open ventilators to lantern.

5. Fix required jet, mix or blow through. The mixed jet should not be used unless both gases are under pressure from cylinders.

6. Connect hydrogen (coal gas) cylinder (painted red) with H tap, and oxygen cylinder (painted black) with O tap, by means of the tubing.

7. Bypass of jet should be open, *i.e.*, with the word 'On' at the top of the head of the revolving rod which extends outside the lantern.

8. The H and O taps should be turned off, *i.e.*, at right angles to the pipes they control.

9. Turn on gases at cylinders by means of key. Turning the key about 90° is generally enough.

10. Take a lime cylinder from tin. Clear out hole in centre, dust it, and fix it on its support in the lamp.

11. Slowly turn on H tap, applying a match to jet, and light the gas; let it burn with a small flame, reaching to about the top of the lime, for at least five minutes, keeping the lantern closed for the sake of greater warmth. The lime can be rotated as required, and at the same time it is gradually lowered or raised.

12. Adjust distance of lime from jet. The surface should be about three-sixteenths of an inch from jet, a final adjustment being made when O is turned on.

13. The H flame being small—say, one inch long—slowly turn on the O tap till the flame begins to change and shorten; then a little more H; then a little more O, and so on.

14. Make final adjustment of lime. With the blow-through jet the lime should be as close to the nozzle as possible, without a black spot in the centre being visible. With the mixed jet it should be as close to the nipple as the turning of lime cylinder will permit.

15. Adjust incandescent point of light into focus of condenser. The conjugate focus should fall about the centre of the objective (diaphragm slot). You will therefore want to insert a slide, and focus it on a screen. Having got your objective approximately right, perfect the centering of your light—raising or lowering, slewing to right or left, advancing or retiring—so as to get an evenly illuminated disc on the screen. Refocus slide, and make any final adjustments required.

16. Final regulation of gases to get the best possible light.

17. When all is satisfactory, turn off bypass, so that word 'Off' is at the top of the head of the revolving rod. Do not touch taps again, unless they get shifted by mistake.

18. The lime should be slightly turned after changing each slide, an intermediate turn being given after every two or three minutes, if the description is long. This is to avoid pitting. A deep pit or crack is liable to make the jet hiss, and the flame is sometimes thrown back on to the condenser, and cracks it.

19. If the hydrogen has been kept long in its cylinder, it is liable to clog the jet a little. If so, turn light down by the bypass, and touch the jet with the point of a knife. Nothing should be inserted into jet that can possibly make it rough inside.

20. To extinguish the lamp, turn off O and H taps little by little, commencing with the O tap. Another plan is to turn off the bypass, turn off oxygen and hydrogen at the cylinders, revolve incandescent part of lime to back of lantern, and blow out the small flame.

'OPTIMUS' HAND CAMERA LENS.

Perken, Son & Rayment have submitted for examination a rapid doublet lens of their manufacture suited for quarter-plate work, and particularly designed for hand or detective cameras. The mount is of aluminium, with an iris diaphragm, and is reduced to a minimum both as regards weight and bulk. The lenticular components are constructed so as to give a wide visual angle, combined with great rapidity (*f*-6) and sharp defining power.

On the mount 4¼ × 3¼ is engraved as the arc the lens covers. We, however, find the circle of light it projects is equal to fully six and three-quarter inches diameter. This is a highly elegant optical production.

SLIDE-MAKING BY REDUCTION.

A writer in the *English Mechanic* (Mr. A. P. Wire) gives some useful hints about artificial illumination in producing lantern slides by reduction. He recommends two albo-carbon gas burners as giving the best kind of light to be reflected from a white surface. This he makes by straining, in the usual way, a piece of white drawing-paper on a drawing board, and giving it two coats of Chinese white. With *f*-11 he finds, using a hydroquinone developer, that about three minutes is the average time required to obtain thoroughly good slides on bromide plates. It has been stated that the incandescent gaslight is less rich in actinic rays than a visual inspection of its light would lead one to suppose, but we cannot but think that, used in the above manner, it would be found to require a still shorter exposure than that required by albo-carbon.

PLATINO-CHLORIDES AND PLATINUM SUBCHLORIDES.

The veteran experimentalist, Mr. M. Carey Lea, thus describes the preparation of platino-chlorides :—

The methods now in use for obtaining potassium platino-chloride are: 1. Heating platinic chloride to 250–300° C., and treating with potassium chloride. 2. Passing sulphurous acid through a boiling solution of platinic chloride and treating with potassium chloride. To these older methods Thomsen has added: 3. Treatment of potassium platini-chloride with cuprous chloride.

All these have objections. With (1) it is not easy to obtain a uniform conversion, (2) requires to be very closely watched to catch the exact moment at which the change is complete, (3) is liable to a vexatious reverse action by which platinous salt is reconverted into platinic salt at the expense of the cupric chloride present. Thomsen mentions this danger as occurring in hot solutions. It probably depends, however, more on concentration than on temperature. The larger the proportion of cupric chloride present in any solution, the greater the tendency to reversal. In one case a half litre of mother water containing platinous salt was set aside for spontaneous evaporation. In a few days large crystals of the red salt began to form; in a few days more, instead of these increasing, there was not a crystal of the platinous salt left.

These objections led me to look for something different. I have found two methods, either of which gives good results.

FIRST METHOD. POTASSIUM ACID SULPHITE.

Potassium platinic chloride is to be moderately heated with solution of the acid sulphite. Convenient propertions are—

Platinum salt	12 grammes.
Acid sulphite	9 ,,
Water	160 c. c.

The mixture can be placed over a hot-water bath in a covered vessel and left to itself. The reduction takes about ten to twelve hours, and is known to be complete when the solution has a pure red colour, free from yellow. The cover is then removed, and the liquid evaporated to the crystallising point.

If, as may happen, the red chloride and the other salts crystallise out together, it is best to redissolve them by heat in a small quantity of water saturated with potassium chloride. The red salt then crystallises out first.

SECOND METHOD. ALKALINE HYPOPHOSPHITES.

By reason of its great reducing powers, a very small proportion of alkaline hypophosphite is capable of converting the yellow platinum salt to the red; theoretically, one part of hypophosphite should reduce nine or ten parts of platinum salt. We can hasten the operation somewhat by using an excess of hypophosphite, but then must work at a lower temperature. Both methods will be given.

In using an excess of hypophosphite, it is convenient to take 10 grammes of platinum salt, 2 grammes, or even more, of potassium hypophosphite, and 600 c. c. of water. These are placed in a flask and very gently heated. The best temperature is 66° to 70° C.

There is a very easy way of obtaining this temperature, and of keeping it perfectly constant for any length of time, by taking an ordinary water stove of the kind in which a chamber is surrounded on five sides by water. Such a stove is to be furnished with a Kekulé constant level, regulated to keep the water jacket half full. If, now, the heat is turned on so as to keep the water gently boiling, it will be found that solutions placed *on the top* maintain a perfectly steady temperature, varying from 55° to 72° C., according to the shape of the vessel, but constant for any one shape. The lowest temperature, about 55°, is obtained with an open, flat porcelain basin. It rises gradually as the shape of the vessel tends more to check evaporation. When a litre flask has about two inches of solution, the temperature will remain steady at about 66°, and this temperature is very suitable for the treatment just described.

Even with this excess of reducing agent, ten or twelve hours will be required. This solution must not be allowed to evaporate to less than one-half its original bulk.

The completion of the operation is known by the solution showing a perfectly pure ruby-red colour. The slightest shade of orange indicates the presence of the yellow platinic salt. It is much safer to allow the solution to evaporate spontaneously. If evaporated by heat, there is always a chance that the reduction may go too far.

There is not much to choose between these two methods. The first, with acide sulphite, is the safest, because there is no danger of carrying it too far. On the other hand, in the second method, the red salt separates more easily and completely in crystallising.

On the whole, the method which I prefer is to keep down the hypophosphite, and use a higher temperature and longer heating. For this, a weighed quantity of platinum salt may be placed in a flask, with 30 c. c. of water for each gramme of the salt, and a quantity of potassium hypophosphite equal in weight to one-ninth of the platinum salt. The flask is to be placed in a water bath which is kept at 80° to 90° C. In consequence of a small portion of hypophosphite, the action is slow, requiring about eighteen or twenty hours for complete conversion. No attention during this time is required, and the advantages are that the solution becomes sufficiently concentrated to crystallise on cooling, and that the very small quantity of foreign matter introduced renders it easy to obtain a pure product.

At 100° C. the reduction to red salt takes place in about fifteen minutes. This method is practicable, but requires great circumspection. If the boiling is continued a little too long, the solution suddenly turns brown, the reduction has gone too far.

If a quick reduction is desired, it is better to use an acid sulphite as a reducing agent, and the following method gives satisfactory results. In a flask are placed 300 c. c. of water, 24 grammes of potassium platinic chloride, 12 grammes each of potassium acid sulphite and potassium chloride. Sodium acid sulphite should not be used. The introduction of sodium salts interferes with the crystallisation; not indeed with the first crop of crystals, but later. These are made to boil rapidly together for twenty-five minutes, reckoned frem the time when actual boiling begins. The solution is allowed to cool, filtered if necessary, and placed in a large flat-bottomed glass or porcelain vessel. In a day or two the red salt will commence to form large crystals. The addition of the potassium chloride causes the red salt to crystallise out first.

It has seemed worth while to give these methods in some detail, because the red platinum salt is likely to find a constantly increasing use in photography, not only for platinum printing, but as a substitute for gold in toning. There is no doubt that platinum is a much better metal for toning silver prints than gold. Its tones are better, and its action is much more reliable.

By all these methods this beautiful salt is obtained in fine ruby-red prisms

PROBABLE EXISTENCE OF A PLATINUM SUBCHLORIDE.

If, in obtaining potassium platino-chloride with the aid of a hypophosphite in excess, the heat is continued after complete conversion to the red salt, the solution in a few minutes changes from red to dark brown. The substance which gives the solution this dark brown colour exhibits the following properties:—

It is very deliquescent and cannot be crystallised. There is no satisfactory method of separating it from the other substances in solution. An oxide of platinum appears to be precipitated by the addition of potash, and this precipitate, when freshly made, dissolves easily in hydrochloric acid; but, if it is thrown on a filter and washed, almost the whole of it runs through. This difficulty, it is true, can be avoided by washing with a dilute solution of potassium chloride; but the precipitate after washing is no longer soluble in hydrochloric acid, except that the acid dissolves out a little protoxide derived from the red salt, some of which is apt to escape reduction.

The brown solution exhibits the following reactions:—

Hydrochloric acid has no effect.

Nitric acid decolourises it.

Potash produces a brown precipitate, soluble in an excess of the precipitant.

Ammonia a brown precipitate, insoluble in an excess.

The solution itself is opaque by reason of its intense colour. When largely diluted, it is yellowish-brown and perfectly transparent.

From the method of obtaining this substance there seem to be only two possible explanations of its nature. First, that it is metallic platinum in a state of solution; this is decisively negatived by the reactions just described. Second, that it is a chloride containing less chlorine than platinous chloride; therefore a subchloride. If the precipitate obtained by potash could, after washing, be dissolved in hydrochloric acid, its constitution could easily be determined; but during the washing it seems to be converted into metallic platinum.

I have noticed that, when a solution of the ruby-red salt $2KCl, PtCl_2$, is spread on paper and exposed to sunlight, it does not blacken, but assumes a yellowish-black colour; it would seem, therefore, that light acts upon it in much the same way as a hypophosphite, reducing it probably to a subchloride. If the reduction was to metallic platinum, this would be shown by the production of an intense blackness.

In all this, analogy with silver salt is unmistakable. Pure silver chloride is not reduced to metal by the action of light, for after exposure it yields nothing to nitric acid. Both metals seem to form subchlorides, the oxides corresponding to which are very unstable.

PLATINUM ON GLASS MIRRORS.

PROFESSOR C. C. HUTCHINS writes to *Astronomy and Astro-physics*:—

Wright's electrical process, by the deposit in a high vacuum of vapour from an induction spark, is admirable for small surfaces, such as galvanometer mirrors, but is not applicable to large ones. What is wanted is a chemical method, similar to that of silvering, by which a coherent film is deposited from a solution. I venture, in view of the importance of the matter, to refer to some incomplete experiments of my own which seem capable of solving the problem. I send you a small mirror, about 3 × 2 cm., which was coated by such a chemical process. I have rubbed this mirror hard with the fingers, with rouge, washed it in hot and cold water, and with strong nitric acid. It seems as permanent as the glass upon which it is deposited. The method is as follows:—

Solution I.

Chloroplatinite of potassium	1 gramme.
Water	6 c.c.

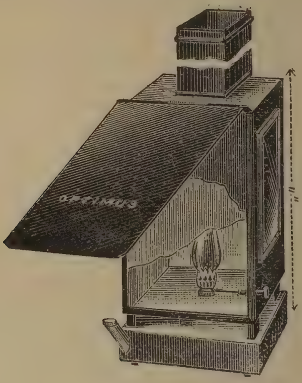
Solution II.

Make a five per cent. solution of neutral potassium oxalate. Warm 100 c.c. of this and add ferric oxalate 20 grammes. Filter and keep in the dark or in a black bottle.

Clean the glass as for silvering. Mix equal parts of I. and II. Have the glass dry and warm; pour a thin layer of the mixed solution upon it, and place it in strong sunlight. The surface tension of the liquid prevents it from running over the edge of the glass, and the plate may be rocked about, if the liquid layer be not too thick. Light reduces the ferric oxalate, which dissolves in potassium oxalate and reduces the platinum. I have experimented upon ordinary lantern-slide glasses ($3\frac{1}{4} \times 4$ inches), and have sometimes secured perfect films over the entire surface. Unfortunately, however, there is no certainty about the action, and failure has been more frequent than success. When you get a good film it is very good indeed, and I write this, hoping that some one may be able to suggest some modification by which the action may be made certain. Of course I have tried great numbers of modifications, but thus far have produced nothing better than the above. The fact that it will sometimes work to perfection is proof, nevertheless, that it can be made to always do so. The editor of our contemporary remarks: 'The small platinum mirror sent us by Professor Hutchins is of such excellence as to demonstrate the value of the chemical method of depositing films of platinum upon glass. On account of its permanence, a platinum-on-glass mirror would possess a considerable advantage over the ordinary silver-on-glass mirror, which must frequently be renewed. It is to be hoped that further experiments will be made for the purpose of perfecting the interesting chemical process here described.'

'OPTIMUS' SIGHT-PRESERVING DARK-ROOM LAMP.

MANY photographers have complained of serious inconvenience, and some of injury to their eyes occasioned by the red glare from the non-actinic dark-room lamp. The shade attached to the lamp displayed in the above drawing entirely shields the eyes from the light of the lamp. When the lamp is not in use, the shade protects the two glasses (ruby and orange) from fracture. Ventilation is thoroughly perfected in this lamp. The oil reservoir, being isolated from the flame chamber, prevents the oil becoming heated.



PLATINOTYPE SEPIA AND VANDYKE.

PACKHAM'S Catechu toning process is thus described by Mr. Hector Maclean:—

All workers will therefore hail with pleasure the following means whereby the ordinary black-toned platinotype can be with much certainty and simplicity of treatment turned into a sepia or Vandyke-coloured one. The procedure is supremely easy.

To each pint of water at 140° Fahr., add thirty minims of a stock solution of catechu powder, consisting of a quarter ounce mixed with six ounces water; or, if it is desired to keep the stock solution for more than a few weeks, then use five ounces water, and after solution add one ounce alcohol. The stock solution is made by boiling the compound catechu powder in a glass or earthenware receptacle for three or four minutes.

Having a bath mixed as directed in a clean porcelain dish, it is needful that the bath be kept at a temperature of from 130° Fahr. to 140° Fahr., for which purpose it is convenient to stand the porcelain dish in some tin or iron dish, or tray, which may contain water, or sand and water, and which is heated by being stood over a spirit or oil lamp, or over a small Bunsen or similar gas heater. The bulb of a thermometer (the latter preferably one consisting of a glass rod enclosing a scale on which are marked the degrees) should be allowed to rest in the solution, whereby one can see that the temperature is as it should be.

The bath being at 140°, immerse the print (a dry one is best); in about one minute a change should be perceptible, and in from three to ten minutes, according to circumstances connected with the way in which the print has been previously treated, and dependent upon the taste of the photographer, the toning is complete. The print is then slightly rinsed in two changes of water, dried and mounted.

Either before—or after—mounting, the print is considerably improved in general brilliancy, in the transparency of its shadows, and in the colour of the whole, by gently polishing it with a soft cloth, and a little neutral oleate of sodium, a piece of the latter, the size of a pea, being enough for a half-plate. Those who consider trouble more valuable than time may, instead of employing the above heating arrangement, use the bath at ordinary temperature, say 60° Fahr., in which case all that is needful is to immerse the print in the solution (thirty minims of stock solution to each pint of water) and turn it every hour or so until the desired tone is attained. The time taken may be from three to eight hours, under normal conditions.

The process above described in brief, as I have personally tested it, is that known as Packham's process of treating platinotye prints, and, as far as my own experience goes, it appears to be one whose manipulation is ridiculously easy; furthermore, the results are more certain than with most other procedures which the photographer has to master. Working with the hot bath, I, with complete success, changed a somewhat weak and wishy-washy cold platinotype print into one which showed a pleasant, dark Vandyke warmth of tone, and in which the shadows seemed to have gained much-needed strength and luminosity.

In one respect, the above application of catechu seems similar to the Weir-Brown uranium toning bath for bromides, in that it exercises an intensifying, or rather fortifying effects upon prints treated.

Hence in Mr. Packman's process will be found an invaluable aid to those—and there are, I fear, many such—who, through various reasons, have on their hands a stock of platinotypes which lack pluck or vigour; to all these I say, Get some of this catechu, and turn your comparative failures into comparative successes.

Another, and this too a very valuable, point is that the process is said to work better *when the original platinotype print is made on stale paper* (cold bath, black platinotype); indeed, Mr. Packham recommends that, before printing, the paper should be taken out of its calcium tube, and allowed to lie in a dark cupboard for a day or two. If this be not done before printing, let it be done, says he, before development. In my own case, I did not adopt either expedient; in fact, the prints I experimented on were some developed in March, 1893, and had been put aside as not good enough for the album or mount. To those who propose giving this discovery a trial let me add that the best result is obtained by using a particular blend of various species of catechu, of which there are some four or five varieties, having certain distinctive characters; some kinds, used alone, are of no practical value in the above-described proeess. At present it would be best for experimenters to apply to Mr. James Packham, of

17 Katharine Street, Croydon, who is the patentee, and who will either send applicants samples free, or do so on payment of a nominal charge, pending arrangements now being made for the commercial supply of the materials.

Before conclusion, a few words as to variation in tone at photographer's command. Where the platinotype print has been originally developed in a bath *very slightly* acidulated with oxalic acid, cold or yellow tones are produced by after-treatment with catechu. On the other hand, where the developer has been alkaline, a much warmer tone ensues than if it had been neutral.

Somewhat akin to the effect of a developer upon partly printed gelatino-chlorides, which are developed before toning, the catechu renders visible light action, which the oxalate bath does not bring out ; hence care must be taken that the paper does not, before development in the oxalate, become affected by careless handling. Another caution is that water free from life should, if possible be used, otherwise it will be found advisable to add about a grain to the pint of oxalate of potash, or of neutral oleate of sodium, without which the solution is liable to turn pale pink, and to *slightly* tint the high lights. The addition of the foregoing produces a warmer tone than would otherwise ensue.

As regards permanency, I have seen prints when first toned, over twelve months ago, and inspected them at short intervals since, without being able to notice any loss of vigour or change of colour. They are hung in an ordinary dwelling-room, and receive an hour or two's sunshine each day that the luminary is in the mood.

A CHEAP MAGNESIUM TORCH.

'G. M. H.,' in the *Scientific American*, describes a simple and cheap mode of making a continuous flashlight or electric torch. His reservoir is a small vial. Its cork is fitted with two tubes, one reaching to the bottom of the fluid to receive air blown in through the lamp or from a pair of bellows, while the other, starting from near to top, carries out the jet of magnesium powder blown out through the first. Into the cork is let a ring of wire, rolled round with cotton-wool or tow, placed at the top of a wire rod attached to cork. The tow or wool is saturated with methylated spirit and ignited, and the jet of magnesium powder is conveyed by the exit cylinder just through the ring of fire, and thus continuously ignited. This makes a useful and effective piece of apparatus.

THE CAUSE OF "DEVILS" OR PITS IN PHOTO-ENGRAVED COPPER PLATES.

E. Sanger Shepherd, in the *Journal of the Society of Arts*, writes :—

These pits I believe to be due to particles of inferior metal left in the copper from imperfect refining, or forced into the plate mechanically during the rolling and hammering. The impurities, generally iron or zinc, are attacked much more rapidly than the copper, probably from local galvanic action, and the evil is intensified if the solution contain a large excess of free chlorine.

Messrs. Hughes & Kimber, the well-known firm of copper-plate manufacturers, tell me that they are obliged to reject many sheets of copper on account of these specks, technically known as 'spelter.'

If a plate cut from the same sheet as one affected with 'devils' is examined carefully by reflected light after it has been cleaned with whiting, these spots will be seen as lighter silvery specks ; and, if the plate is then held over the fumes of ammonia until the copper has acquired a decided tarnish, these specks will be still more easily recognised. Although I am unable, from the nature of the trouble, to state a remedy, this simple test will enable workers to avoid the trouble. Plates showing the silvery spots should be returned to the maker; they are quite suitable for mezzotint, or engraving with the burin, but useless for our purpose.

With regard to the etching solutions, it seems to me that the more simple and stable the composition of these solutions the better. The photogravure process is already hedged in with too many elements of uncertainty to render it desirable to introduce another if it can possibly be avoided. What we require is a set of solutions capable of attacking the copper evenly, and a power under our control of limiting the time of biting on any particular tone of the picture. A set of solutions of pure anhydrous perchloride of iron, Fe_2Cl_6, dissolved in cold rain water, fulfils these conditions perfectly, and can be relied upon to act with certainty, but the cost of the pure salt is prohibitive. In the *Manufacturing Chemist* I see the ordinary solid perchloride is quoted at 1*s.* per pound, and the pure neutral sublimed at 10*s.* 6*d.*

A solution of the commercial article will usually be distinctly acid, *i.e.*, contains an excess of free chlorine, attacking the copper with uncontrollable energy, and is liable to cause the resist to blister and rise from the plate; on the other hand, an excess of iron is undesirable, as it hardens the gelatine in patches, slows the etching, and causes the solution to attack the copper unevenly.

The commercial forms of ferric perchloride are as follows:—

1. The anhydrous perchloride of iron, Fe_2Cl_6, Mol. weight 325, prepared by passing chlorine gas over heated metallic iron. Fe_2Cl_6 condenses on the upper part of the vessel as small, dark, iridescent crystals, red by transmitted, green by reflected light; exposed to the air, it rapidly turns yellow and deliquesces. Ferrous chloride, $FeCl_2$, will be found adhering to the remaining metallic iron as light buff scales.

2. Metallic iron is dissolved in hydrochloric acid, and chlorine gas passed through the liquid to saturation; the ferrous is converted to the ferric salt. The free chlorine is then removed by passing a stream of carbonic acid gas through the warm liquid. On evaporation, the solution yields a mass of fine yellow crystals, having a formula $Fe_2Cl_6 12H_2O$, or, more rarely, a red salt, $Fe_2Cl_6 5H_2O$.

3. The liquid. The official solution of ferric perchloride of the B.P., prepared by dissolving iron in hydrochloric acid, and adding nitric acid until the black colour at first produced disappears, resulting in a very dark reddish brown liquid, its colour being due to the solution of *a* N.O. in a portion of the ferrous salt. This trace of nitric oxide renders this form the least desirable for our purpose.

If we boil a solution of Fe_2Cl_6, as recommended by Mr. Denison, some hydrochloric acid is evolved, depending on the degree of concentration of the solution, and a dark solution of ferric oxychloride remains.

Mr. Wilmer recommends boiling the dilute solution with commercial red oxide of iron. Here, again, we have uncertainty, as the commercial oxide formed by roasting sulphite of iron (Fe_2O_3) is nearly insoluble in the solution, and the change would be almost entirely the result of heat.

Freshly precipitated ferric oxyhydrate, $Fe_2O_2 2HO$, is, however, very soluble in the solution, nine molecules of $Fe_2O_2 2HO$ being dissolved by one molecule Fe_2Cl_6.*

The solution I have found most suitable is prepared by dissolving the solid salt in cold rain water. If the salt is tied up in coarse canvas, and suspended in the jar near the surface, the solution will reach 42 Baumé in about forty-eight hours, and it will smell strongly of chlorine. Now expose to the action of the air in a large dish (do not have more than half an inch of solution) in a well-ventilated place, and in forty-eight hours the solution will have become transparent, and the free chlorine have passed off. Now refilter, and make the various strengths by adding cold filtered rain water.

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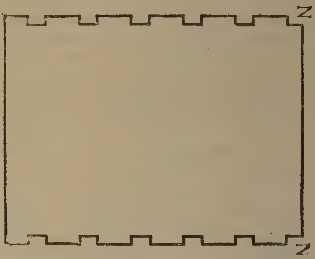
* Bloxham, *Chemistry*, 1894 ed.

The addition of alcohol seems to me also undesirable, as, unless the solution be acid, it causes decomposition, with the formation of insoluble oxychloride of iron; even if acid, the solution slowly loses colour, ferrous chloride and chlorinetted ethereal bodies being formed.

THE FRENA FILM-HOLDER.

This Holder is not unlike to that of a camera dark slide, and like these it can be fitted to any tripod camera. It carries twenty, or any smaller number, of cut films and changes them automatically. Up to the present time only two sizes, half-plate and quarter-plate, appear to have been issued, but when a demand for other sizes has been created they will, doubtless, be supplied. The Frena system, as we have frequently had occasion to explain, recognises the edges of the films being notched, and it is on this that the ability of changing the films in succession depends.



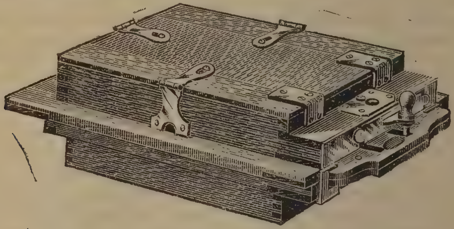


Fig. 1.

The holder in its entirety is shown in fig. 1. In this state, it is ready to to be adapted to the camera by planing down the edges. The Holder consists of two parts, a Magazine and a Receiver. Each of these parts is about half as thick again as an ordinary dark slide. The Magazine contains the pack of films to be exposed, and is fitted to slide into the rebate of the camera. The exposed films are deposited and retained in the Receiver. The exposure is made in the same way as an ordinary dark slide. The shutter draws completely out as in the best American camera slides. When the exposure has been made, the foremost film is transferred from the Magazine into the Receiver. This is effected by folding the Magazine and the Receiver face to face. When the two receptacles are thus adjoined, the shutter of the Magazine interlocks with the shutter of the Receiver. The two shutters are thereupon drawn out together as far as they will go. Then, when the Holder is held in an approximately horizontal position with the Receiver underneath, the change button is pushed to one side. This separates the foremost film, which falls, through the open shutters, from the Magazine into the Receiver. Pushing in the shutters completes the operation of film-changing.

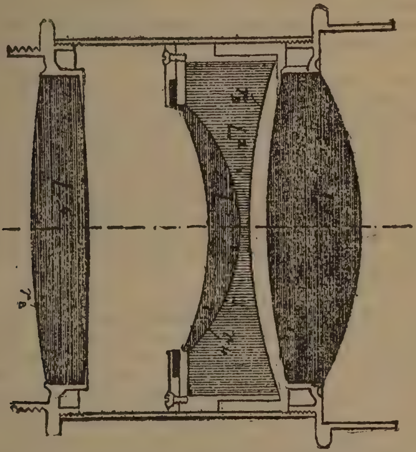
On the discharge of the exposed film from the Magazine, the next succeeding film of the unexposed series automatically takes its place in the plane of the focal register, being carried forward by a spring-pressure board. Thus the entire pack of unexposed films is never released from that gentle pressure which is required to keep these thin and flexible supports perfectly flat, and thereby capable of receiving the sharpest possible image from the lens.

There is a self-acting counter upon the back of the magazine which shows at a glance how many pictures have been taken, and which film of the series is in position for the next exposure.

The film-holders are admirably made, being constructed by machinery which eliminates the personal equation in their formation.

THE COOKE LENS.

THIS lens is *sui generis*, being quite unlike anything that has formerly appeared. Indeed, it is rather difficult of classification. As shown in the cut, which affords a general idea of its nature, one is at first rather uncertain whether to class it as a double or a triple combination. It can scarcely be a triple, for the separation of the first from the second element is too slight to warrant the term, for the particular objective which we have examined has a much less amount of separation than is shown in the cut, but not nearly so much as we find in the back combination of a portrait lens of the same dimensions. The group of three lenses which form the anterior part of the



combination may therefore be regarded as an achromatic whole with an air space between two of them. The negative lens of this group is externally a double concave formed of two cemented elements, as shown in the cut. The back lens is of a form different from that of any other, being almost plano-convex, the flatter side being only very slightly convex, and this lens as a whole made of only one piece of glass.

On trying the lens, we found that with its largest aperture (*f*-5·6) excellent portraits could be obtained, characterised by a combination of softness with all the sharpness desirable in a portrait. The field being quite flat, even with its full aperture, it is self-evident that for taking a landscape or group with very great rapidity it is well adapted, the only necessity for using a stop being to secure greater penetration from the near to the distant. We did not find any presence of flare.

Englishmen are justified in feeling somewhat proud of a lens of the excellence and undoubted originality of this one, having been ushered into the world without having had the aid of the brainwork of Continental mathematicians to whom we have hitherto been so much indebted.

As we have said, it covers flat and well without being stopped down, and therefore it is well adapted for hand-camera work. Its covering powers are greatly extended when the iris diaphragm is brought into use.

PLATINUM TONING.

Mr. J. Kidson Taylor writes in the *Photographic Record*:—

The paper I now use is the Ilford P.O.P., which is subsequently matted on the finest ground glass.

The paper should be printed slightly deeper than the tone required in the finished print, but must not be carried so far as to block out the detail in the shadows.

The untoned prints are to be kept as dry as possible, preferably in a calcium tube, and all touching of the surface by the fingers must be carefully avoided through all the subsequent processes.

They are then to be most thoroughly washed in many changes of water, the first washing water being changed as quickly as possible; when all milkiness or opalescence has disappeared, they should, to eliminate any trace of free silver remaining in the paper, be passed for a few minutes through a bath of common salt, one ounce to twenty ounces of water, before being transferred to the toning bath (the time they are left in the salt bath beyond two or three minutes is of no consequence), they are then placed two at a time, back to back, in the toning bath.

The toning is composed of—

Chloroplatinate of potass (*Harrington's*)	5 grains.
Sodium chloride (common salt)	50 „
Citric acid	50 „
Distilled water	30 ozs.

This bath will keep indefinitely, and only requires the addition of half a grain of platinum to each sheet of paper toned to keep in working condition.

My practice is to tone by time, giving from three and a half to five minutes, and in some cases, where a dark tone is required, up to ten minutes, the change of tone not being very perceptible, unless compared with an untoned print.

When toned, the prints are immediately transferred, without washing, to an alkaline bath, made up of carbonate of soda crystals, half ounce to forty ounces of water; in this bath they may remain till all the prints are toned, the time being immaterial. This bath will turn the prints from red brown to violet, and it must on no account be omitted, as the resulting colour entirely depends on its use—it is most important.

From this bath the prints are to be placed again without washing in the fixing bath.

With regard to the fixing bath there are many diversified opinions. My practice differs considerably from that in general use. What you will, doubtless, consider very heterodox is that I prefer an old used bath, as I feel sure, without prejudicing the permanency of the prints, I by its use preserve, to much greater extent than by using a freshly mixed bath, the delicate half-tones so necessary in a well-graded picture.

The bath I use is made up as follows:—

Hyposulphite soda	4 ounces,
Sulphite soda	2 ,,
Water	40 ,,

made alkaline with one drachm, 880 ammonia.

In this (a used bath) the prints should remain for from 20 to 30 minutes, being constantly separated and rocked the whole time, my theory being that the permanence of the prints depends quite as much, if not even more, on very thorough fixing as on the final washing. Immediately, on being placed in the fixing bath, the violet tone they have acquired in the soda bath is changed to a decided yellow brown, which ultimately darkens as the prints are completely fixed.

The prints are then washed for an hour in a Wood's washer, and as a final operation are treated for five minutes in a chrome alum bath previously made alkaline with ammonia and filtered, making them much more easily matted, so that in mounting the backing of the prints is unnecessary, as they retain their dull matt surface.

After this bath, which, like everything else should be scrupulously clean, the prints only require rinsing and squeegeeing. It is absolutely necessary to squeegee the prints at once without letting them get at all dry, as it is impossible to soften them again if they are allowed to dry.

The above contains all the information your least experienced workers will require for successful manipulation conditional upon the careful usage and attention to details which every true artist will lovingly give to his work.

PHOTOGRAPHIC PRINTING BY MACHINERY.

THIS new process of rapid printing consists essentially of a roll of sensitised bromide paper a thousand yards in length by something over a yard in width, unwound in a room illuminated by red light, fed under two or more negatives, then automatically pressed upward by a platen against the face of the negative, at the same instant also automatically exposed by the flashing of incandescent electric lamps above the negatives, then moved along the proper distance for a fresh section to be exposed, and finally wound up on another roller.

The roll of exposed film is next removed to another room, and automatically developed, fixed, alumed, washed and dried, the finished pictures being wound up on a third roll, from which they are cut to size and mounted on cards in the usual way.

Actually to see how easily and certainly this process works and learn of the obstacles that had to be overcome, not only surprises, but astonishes, the old-time photographer. It is, in fact, a new industry in the line of photographic printing, and will be useful in hundreds of various kinds of businesses where prints by hundreds of thousands from one negative are desired.

The accompanying illustrations sketched from the apparatus in operation give a very good idea of its construction and working.

Taking the exposing apparatus first (fig. 1), the roll of unexposed paper supported on a shaft on the left may be seen hanging therefrom in a loose loop and enters the inclined apron, thence passes directly under the negatives, which are secured to the under side of a large sheet of glass by paper strips in the usual way. The glass plate is held in a removable frame, which permits the negatives to be easily located and secured. When the plate is in position, vignetting masks are laid on top of the plate over the negative, and, if by a trial the exposure has been found too long for one negative, thin sheets of waxed or tissue paper are interposed to weaken the light to the proper degree. Several negatives of a similar degree of density may thus be secured to the plate, and each adapted to the light necessary for a proper exposure. Much care and nicety of judgment is required in this adjustment, as the success of the latter manipulations hinges upon it. Above the negative plate is observed the exposing chamber suspended by a rope passing over a pulley in the ceiling, and balanced at the other end by a weight; this arrangement permits the whole to be raised above the negative plate, giving easy access thereto for the adjustment of vignetting masks. In each side of the case are four 32-candle power incandescent electric lamps connected by flexible cords to a switch on the wall and to the automatic switch below. The heat from the lamps was found to be excessive, and ventilation was obtained and the temperature kept quite uniform by forcing in a current of air with an electric fan or air pump. A square red window on the side allows one to observe that all the lamps go when the switch is turned on.

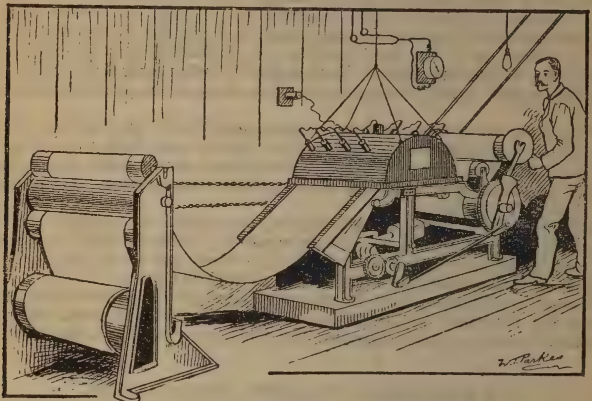


Fig. 1.—Automatic Photographic Printing—the Exposing Apparatus.

After exposure the paper is wound over a pull roll, adjoining the exposing chamber, by an intermittent quick movement equivalent to the length of the negative plate or at any set distance, passing thence to a roll whose axle works in ball bearings, on which it is wound, the roll being rotated by an attendant. A reciprocating motion is imparted to the pull roll by means of a connecting rod attached to a crank shaft located under a feed apron, at the lower left-hand portion of the machine.

The end of the connecting rod at the pull roll engages in a slotted lever, the upper end of which has a ratchet and pawl operating in teeth on the periphery of the pull roll. The end of the rod may be moved nearer the centre of the roll in the slotted lever, and so regulate the throw or amount of rotation. A sprocket wheel at the opposite end of the pull roll is connected by a chain with the feed roll. It is evident, therefore, when the pull roll makes a half revolution rapidly, the feed roll is also simultaneously rotated, causing the same amount of paper to be unwound as is taken up at the other end. Geared with the crank shaft under the feed apron is a shaft having a cam for operating at the right moment the electric switch for the lights, and another cam for lowering the platen (see fig. 2). Prior to the moment of exposure, the cam, as it rotates, permits the pivoted weight to draw the bell crank lever supporting the platen forward, and press the platen upward against the under side of the paper, placing the sensitive side of the latter in contact with the negatives during the interval of exposure (usually two seconds), it is then drawn down until a fresh section of paper passes under the negatives and the operation repeated. The movement is quite similar to the platen of a printing press.

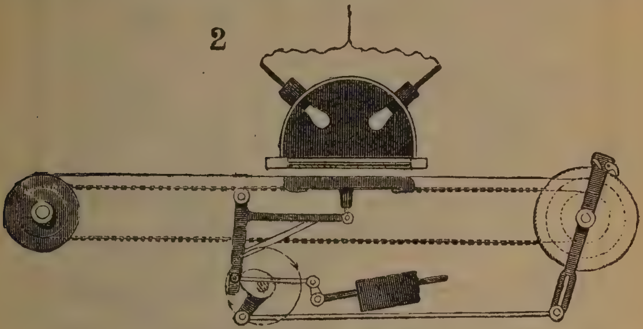


Fig. 2.—Detail of Exposing Apparatus.

The roll, containing two or three thousand exposures, is carefully protected from white light and carried to the room in which is located the automatic developing machinery (fig. 3).

It is a most interesting sight to see the gradual development of the exposures here. As may be imagined, the exposed roll is set on supports at the right-hand end of a long wood tank containing separate water-tight compartments, and is carried over a roll into compartment No. 1, about 3½ feet deep, filled with 120 gallons of an old solution of ferrous oxalate developer. Referring to fig. 4, it will be noticed that half way up from the bottom of this compartment is a submerged roll. Running down vertically in the centre of the sides of each compartment is a slotted way, to guide the axes of small, loose, brass rollers which carry the paper to the bottom, and freely revolve as the paper moves forward.

Over the division of each compartment is an actuating roll, all being geared to a worm screw running along the top edge of the long tank its entire distance, which gives every roll the same speed.

The paper, after passing over the submerged roll (fig. 4) and down again, thence up out of the tank over the roll between the first and second tanks, and down into the fresh ferrous-oxalate developer in this tank, shows the images half developed out. The electric lamps overhead are a non-actinic red.

Coming out of the second tank, the images are fully developed, thence the paper passes on into the third vat, containing dilute acetic acid, which dissolves out all of the iron left in the paper from the developer, and acts as a check to further development, thence in the next vat the paper is washed with water; next it passes into a fixing vat containing a solution of hyposulphite of soda,

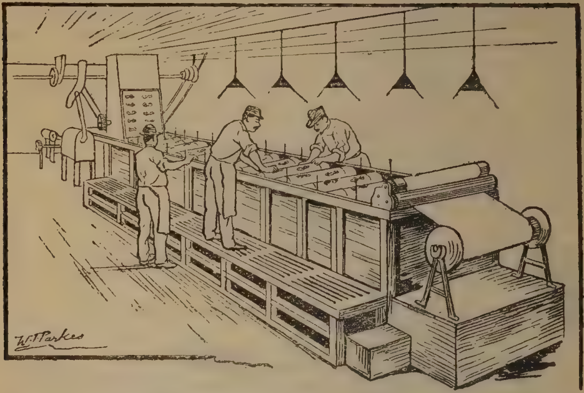


Fig. 3.—Automatic Photographic Printing—the Developing Apparatus.

s again washed in the following tank, then it passes into a vat of alum water, which hardens the film, and finally goes through two or three vats of water, receiving a final spraying as shown in fig. 4

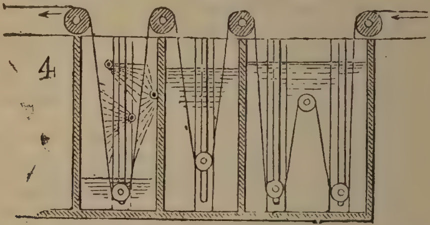


Fig. 4.—The Developer Tank.

From the latest spraying it is led on to an endless canvas carrier into a long enclosed chamber filled with a current of warm air, heated by a gas furnace noticed near this end. At the end of this heated chamber the paper comes out perfectly dry, and is rolled up with the pictures all on it. When the run is complete the roll of pictures is unwound, they are cut off to the respective sizes desired, and mounted in the usual way.

While the paper is travelling over the several rolls, attendants with sponges sponge off any dirt or light material which may cling to the surface as it is drawn up from the solutions. At the further end of the trough the paper with the pictures upon it may be seen travelling upward.

A very curious anomaly is the mixture of white and red light in the developing room. The two lamps over the developer and roll where it is unwound are red, while all the others are white. There is just enough red to neutralise the white at the beginning. Thus it makes the brightest dark room we call to mind, and was a surprise in art of photographic manipulations.

There are twenty-seven rollers on the large box tank, and the tank itself is not far from one hundred feet in length. The paper travels through the tanks at the rate of ten feet per minute, and it is possible to arrange enough cabinet negatives in the exposing machine to expose 245 cabinet pictures in a minute. But an ordinary day's work of ten hours yields 157,000 cabinet pictures.

We are informed that it is the only machine of its kind in this country, and but one other is in Germany. The work which we saw made by it was very satisfactory and uniform.

In dealing with such large quantities of material, uniformity appears to be easily attained, and the applicability of a similar machine, properly modified to the development of negatives and films having had reasonable uniform shutter exposures, may be a possible outcome of this invention.

For the foregoing particulars we are indebted to the Automatic Photograph Company, No. 25 West Twenty-fourth Street, New York, through whose courtesy we were permitted to witness all the details of this remarkable and interesting apparatus and plant.—*Scientific American.*

VOIGTLANDER'S COLLINEAR LENS.

From external observations one immediately discovers that it is a symmetrical doublet, front and back lenses being similar in form and focus. The focus, measuring from between the lenses where the stop (an iris) is located is six inches, and the remark may here be interpolated that, although we have examined others, the special one of the Collinear series on which most of our remarks mainly hinge, is that described in the Marion Catalogue as No. 3, having an equivalent focus of 150 millimetres, 26 millimetres in diameter, covering, with full aperture, a plate 6½ × 4¾ inches, or, roughly, 8¼ × 6⅓ inches when stopped down from *f*-18 to *f*-36. These are approximate catalogue measurements. The price of this lens, with iris diaphragm, is 7*l.* 10*s.*, and the cut here given represents exactly its size.

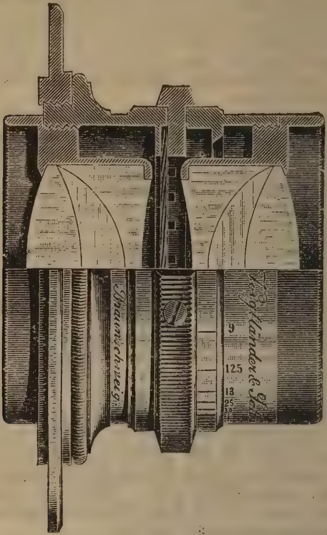
Disregarding for the moment the smaller size mentioned as being covered with full aperture, we have the lens attached to a whole-plate camera, and with full aperture (*f*-6·3) we focussed a test object, situated at a distance of about 400 feet, directly on the centre of the ground glass, using an eyepiece in focussing. The camera was then slowly rotated, so as to bring the test object up to the extreme edge of the ground glass, focal examinations being occasionally made during the rotation. The sharpness of the object was maintained until the object disappeared beyond the margin of the focussing screen.

Finding this to be the case, we transferred the lens to a 10 × 8 camera, and repeated the trial, still with full aperture. The flatness of field was still of the most pronounced character, except at the extreme edges. The corners, too, were dark. A good panorama, 9½ × 6½ inches, could have been cut out with perfect sharpness throughout, which, for a lens of such shortness of focus and width of aperture, must be considered as somewhat astonishing.

Our attention was next directed to the employment of one lens alone, viz., the back one, which was left *in situ.* With this the whole of the 10 × 8 screen was covered with a degree of sharpness, no stop being employed, amply sufficient for every pictorial purpose, showing a freedom from spherical aberration which we were not prepared to find in any single cemented lens, no matter what might be its components. On reducing the aperture, the crispness of the definition seemed to be slightly improved.

Far different was the case when the front lens was tried alone, also *in situ;* it was sharp in the centre, but by no reasonable amount of stopping could the plate be covered.

As a lens of what may be supposed a novel form, we can only regret that no information as to the nature of the glass appears to have been forthcoming.



One thing, however, is apparent: Messrs. Voigtlander appear to have obtained the admirable results we have described by means of glass of singular purity, both as regards freedom from colour and air bubbles in the glass—not that the latter signifies much when in moderation, although mechanical perfection even in this is desirable. Yellowness in the glass is at all times to be deprecated as tending to slowness of action.

Each element in this doublet will be seen from the illustrative block to be formed of three cemented lenses of different forms. Measuring one of these from the outside, the first is a double convex, the second a deep meniscus, the third a crossed concave, the whole forming a meniscus. We could discover no trace of astigmatism.

ORTHOCHROMATIC PHOTOGRAPHY WITH ORDINARY PLATES.

Mr. F. E. Ives asks, Can colour screens be made to secure orthochromatic photographs with ordinary plates? I have selected from hundreds of spectrum photographs eleven which appear to show not only that they can, but also the reason why almost everybody who has tried has failed to obtain such results.

The plates used were Seed ordinary, sensitometer No. 27. The make-up screens were coloured films of gelatine and collodion on selected plate glass, sealed by cementing to another plate glass—a method which I published ten years ago, but which has recently been credited to a writer who merely re-published it without acknowledgment. Only three dyes are represented, although many others give just as remarkable results.

The photo-spectrograph—the fifth one that I constructed—contains a train of light crown-glass prisms and an ordinary photographic lens. Crown-glass prisms were used because they are more transparent to the dark violet and ultra-violet rays than flint-glass prisms.

The photographs are all of the solar spectrum, made on very clear days, between one and four o'clock p.m., as follows :—

1. Ordinary photograph.
2. Through light yellow glass.
3. Through deep yellow glass.
4. Through deep naphthol yellow in gelatine (brilliant bright yellow).
5. Through light chrysoidine in collodion (impure yellow).
6. Through medium chrysoidine in collodion (deep orange).
7. Through deep chrysoidine in collodion (orange red).
8. Through multiple yellow in collodion (bright golden yellow).
9. Through multiple yellow and naphthol yellow (bright golden yellow).
10. Through deep chrysoidine and naphthol yellow (orange red).
11. Through lighter naphthol yellow.

The photographs are submitted for examination, and I have also made a drawing representing the density curves in such a manner that they may be compared at a glance. The curves are drawn by the eye, and are not, of course, strictly accurate, but are sufficiently so not to be misleading for the purposes of this investigation.

The first curve in the drawing marked 'A' represents the luminosity of the spectrum.

It will be seen that the photographs through yellow glasses differ so little from the ordinary photograph as to indicate no material advantage in the use of a yellow glass with ordinary plates. It is true that the deep yellow glass perceptibly reduces the relative action in the ultra-violet and violet, but the maximum action is still in the blue or blue-green, and neither the ultra-violet nor violet are cut out, nor is there any perceptible action in the yellow.

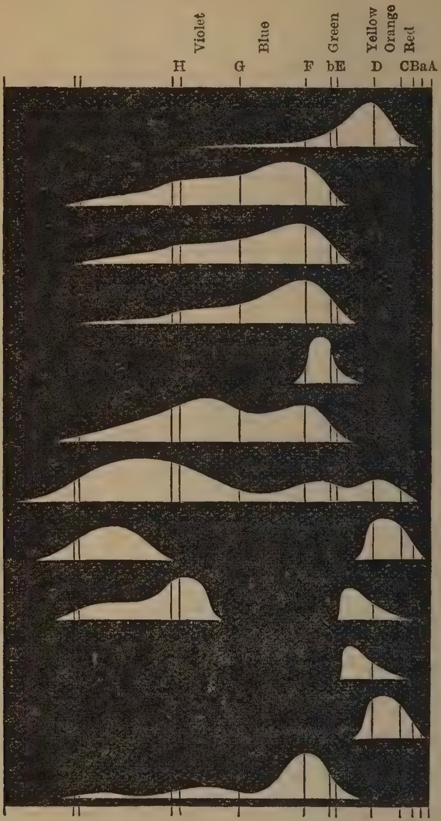
The deep naphthol yellow, on the other hand, although several shades lighter to the eye than the deep yellow glass, cuts out completely all of the ultra-violet, violet, and violet-blue rays, confining the action chiefly to the blue-green and green. It is evident that with this screen green and light yellows (which reflect the green rays) should photograph lighter than true blues, showing thereby a very distinct gain over ordinary photography for many subjects.

The three photographs through chrysoidine show how little may depend upon the kind of dye used, and how much on the quantity. A chrysoidine screen could be made so light that it would not remove the point of maximum action out of the blue; the lightest screen used moved it into the violet, while a deeper one moved it into the ultra-violet, and a still deeper one gives the strongest maximum away off at the other end of the spectrum, in the orange-red.

The multiple yellow screen cuts out all of the blue and blue-green of the spectrum, and carries the action well into the red, with a maximum in the yellow-green; but, although this green is an intense golden-yellow to the eye, the strongest action is in the dark violet, and extends a long way into the ultra-violet. More than three-fourths of the total action is by dark violet and ultra-violet rays, although a spectroscopic examination under ordinary conditions would not discover the small amount of violet light that gets through.

The addition of the naphthol yellow to the multiple yellow does not noticeably alter the colour of the screen, yet, by cutting out the residue of violet and ultra-violet, confines the action to the yellow-green, yellow, orange, and red rays, the strongest action being in the yellow-green. Even this screen is lighter to the eye than the deep yellow glass, yet secures on the ordinary plate *relatively* more action in the orange and red than any yellow screen will give with commercial isochromatic or orthochromatic plates.

The most promising combination of all is that of chrysoidine and deep naphthol yellow. The deeper chrysoidine screens do not transmit any violet



ight than can be detected in the spectroscope, even with direct sunlight, open slit, and blue glass to screen the orange-red and yellow rays; yet, without the addition of the naphthol yellow or an equivalent, most of the action is at the violet end of the spectrum. Reference to the chrysoidine screen photographs will show that with this combination the action can be not only confined to the more luminous portions of the spectrum, but that, by varying the amount of chrysoidine, the maximum action may be kept either in the green, yellow-green, yellow, or orange, as desired.

A gaudily coloured chromo-lithograph was photographed through all of these screens except the lighter naphthol yellow, and the result was in each case what would have been predicted from an examination of the spectrum photographs, except that, when the screens transmitted rays at both ends of the spectrum, the relative action by the more refrangible rays was much greater than the spectrum photographs indicated. For instance, in the spectrum photograph made through the deep chrysoidine, about 40 per cent. of the total amount of action appears to be 'at the red end, yet the exposure for a street view had to be increased to about eight times when the napthol yellow was added. It was thus proved that even with the crown-glass prisms the photo-spectographic test did not indicate anywhere near the true photographic value of the more refrangible rays. What is equally remarkable, the same chrysoidine screen, which, in the camera, allowed most of the work to be done by invisible rays, showed no action whatever in the ultra-violet when tested in a costly direct-vision photo-spectograph, not even when the exposure was so long as to produce considerable halation and general fog from scattered light. No doubt, large direct-vision prisms, made with some of the new Jena glasses, might show a different result.

The chromo-lithograph contained the following colours: three shades of blue, strong green, deep yellow, deep red, and purple. Photographs made through the yellow glasses, and all screens transmitting ultra-violet rays, rendered all blues white, or nearly so, and yellows and dark greens nearly black. The photograph made through deep naphthol yellow rendered green and deep yellow and medium blue all as medium light grey; red as black. The photograph made through combination of multiple yellow and naphthol yellow rendered ruby red and dark blue about alike, green lighter, and yellow nearly white. Although the density curve in the spectrum photograph does not indicate that this is an ideal screen, it is a *yellow* screen that gives truer results on ordinary plates than yellow glasses give on commercial isochromatic or orthochromatic plates. The combination of deep chrysoidine and naphthol yellow rendered dark blues and greens almost black; delicate sky blue, darker than bright yellow; yellow, not quite white; deep red, rather too light. A compromise between this result and the one before it would be better than either; it could be obtained by using a little less chrysoidine. Such a result is shown in No. 5. The exposures (in direct sunlight) varied from a small fraction of a second for the ordinary photograph to two minutes for the one made through combination of deep chrysoidine and naphthol yellow. The exposures for the spectrum photographs also varied from a fraction of a second to two minutes, the aim being to obtain good, but not excessive, density in the parts showing most action, with the same development that would ordinarily be given for a correctly exposed landscape.

The results which I have presented to your notice lead me to conclude :—

First.—That the relative amount of action by the dark violet and ultra-violet rays in ordinary photography is far greater than has been generally supposed.

Second.—That spectroscopic examinations of colour screens, and even photo-spectrographic tests as ordinarily conducted, are not competent to discover their true photographic value.

Third.—That the first essential in a colour screen is that it shall cut out the dark violet and ultra-violet rays, and that to failure in this particular is due the inability of most experimentalists to obtain improvement in colour rendering by the use of colour screens with ordinary plates.

Fourth.—That, with suitable compound colour screens, much truer colour values can be obtained on ordinary plates than yellow glasses will give on commercial isochromatic or orthochromatic plates.

This is not a new discovery. I demonstrated the facts by actual experiment, and showed results which should have been as conclusive as anything I have here, at the Franklin Institute, nine years ago. In fact, the most striking illustration of the value of the method which I have with me to-night is the identical photographs which I then showed, in comparison with the Prang chromo from which they were made. My excuse for bringing the subject up again is the prevailing ignorance of the facts, as indicated by such statements as the following, which I quote from well-known photographic journals:—

'Questions that have been addressed to us in regard to the employment of the yellow screen with ordinary or non-colour sensitive plates, as well as some remarks on the subject that have recently been published [in *Journal of the Camera Club*, London, February, 1894, page 28?], indicate the existence of erroneous ideas on the point. . . . We are writing for the express information of many of our professional and amateur friends. . . . Years back, to test this point of the influence of the yellow screen on ordinary plates, we subjected the matter to experimental examination, the issue being that the only observable effect was to increase the exposure without altering the relative tone renderings, and more recently we have repeated the experiment with the same results. . . . The idea is false in theory and unsound in practice. . . . We unhesitatingly negative the assumption that for any practical purposes the use of a yellow screen with sensitised plates not corrected for colour is of the slightest value.'

'It is now clearly determined that the use of orthochromatic plates for rendering correct colour values is absolutely necessary.'

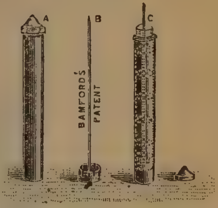
'I have often heard it said, and often seen it written, that a yellow screen gives an isochromatic or orthochromatic effect with an ordinary plate. My opinion of a man who says this is that he is not a fool, but a deliberate fibber, if not worse. No one who has ever tried this once would make the statement. And I most emphatically deny that a yellow screen has any effect on an ordinary plate, except to make the negative worse than it otherwise would be.'

Of course, this is not the kind of orthochromatic process to be recommended for practical purposes in a London fog. It is quite practicable for the reproduction of paintings in direct sunlight, or even in the studio when the light is good. I have photographed a good many paintings in the studio by this method. It is also practicable for general outdoor photography where time exposures can be given. I have employed it with unqualified success when thousands of miles from home and having no colour-sensitive plates with me. At Pompeii I gave an exposure of five minutes on a mosaic fountain. The guide, who evidently took me for an inexperienced amateur, said it was not necessary to give such long exposures; he had seen the same object photographed with 'cap off and on' exposure. Such a result as I obtained would justify a half-hour's exposure if necessary.

Some of the compound screens give better results with ordinary plates than ordinary yellow screens do with commercial isochromatic or orthochromatic plates, and the method is therefore to be preferred under some circumstances, although it is possible with quite different compound screens to obtain the same results on the commercial colour-sensitive plates with shorter exposures. For instance, a combination screen of brilliant yellow and fuchsine can be made that will secure on a commercial isochromatic plate a photograph which pretty accurately represents the luminosity of the spectrum, and always gives nearly photometrically correct translation of colours into monochrome when used with such plates. The naphthol-yellow and chrysoidine screen with ordinary plates requires much longer exposures than the brilliant yellow and fuchsine screens with isochromatic plates, but the results are substantially the same.

THE PERFECTION LIME CASE.

THIS handy little lime-holder, sold by J. W. Bamford's Executors, 242 York Street, Rochdale, has many features that should commend it to lanternists. Its uses and action, shown in the illustration, are thus described :—

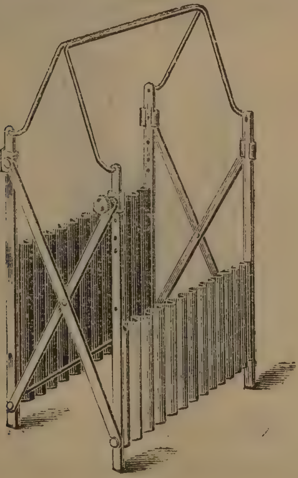


A shows it closed with a new design of metal cap, which, being six-sided, prevents the case from rolling when placed in a horizontal position. B shows the holder, by the point of which the lime dust is removed from the hole in the lime, thus leaving it clean and ready for use. C shows the holder inside the case, with the limes threaded upon it, and drawn up ready for taking off a lime.

When in use, the case will not roll off a table, hence breaking of limes from this cause is prevented. It is adapted for either large or small limes. The limes, being threaded on a wire holder, are rendered free from lime dust, thus avoiding the nuisance of having to pierce them when wanted. By this method of storing, the limes are not only kept perfectly dry, but are less liable to become damaged. A single lime may be removed from the case without disturbing the relative position of any of the others; prevents the hands and clothing of the lanternist becoming soiled with lime dust.

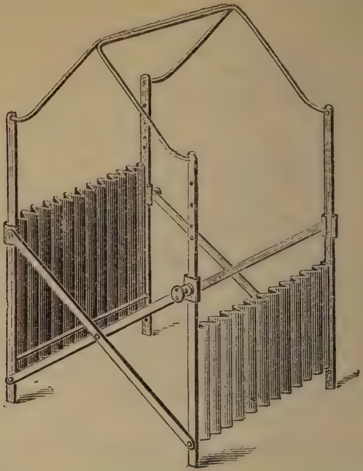
HINTON'S COMPREHENSIVE FOLDING RACK (PATENT).

THIS rack is one of the many handy little specialities with which Messrs. Hinton & Co., of Bedford Street, London, provide photographers. It has been

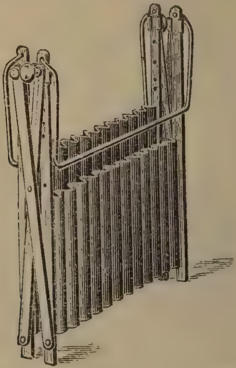


Rack partly expanded. For small plates.

designed to meet the requirements of photographers requiring more than one size. Any sized plate may be put into the rack, from lantern size to whole-plate in the small size, and from lantern size to 12 × 10 in the large size. The rack is perfectly rigid without the plates, has no loose pieces, is most easily fixed to required size, and folds flat into small space. The illustrations fully explain its excellences.



Same rack fully expanded. For large plates.



Same rack folded when not in use.

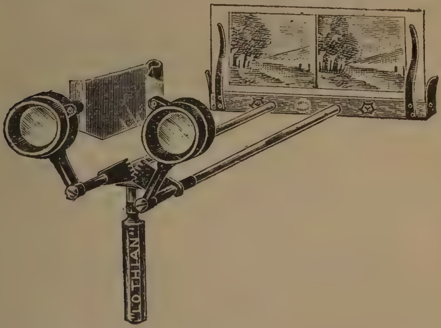
'OPTIMUS' CAMERA DE POCHE.

Much ingenuity has been displayed in devising the form of this instrument. It is at once the quickest to open and to reclose, as well as the smallest camera which allows a full quarter-plate picture to be taken. Turning the milled button at the side is the only movement necessary to open out the instrument preparatory to taking a photograph, which movament at the same time includes the necessary adjustment of focus, ensuring absolutely sharp definition. To reclose the camera, the milled head or button requires similar rotation, but in the opposite direction.

The shutter is one of the most modern, of the roller-blind type, with adjustment for varying speeds. The lens covers very amply, and gives good definition. It works with the aperture of *f*-6, is of the extra rapid euryscope type. It is mounted in aluminium, and has an iris diaphragm fitted.

THE 'LOTHIAN' STEREOSCOPE.

Mr. Andrew H. Baird, 37 and 39 Lothian Street, Edinburgh, has introduced a capital form of stereoscope. A good idea of it will be formed by inspecting the cut. A great objection to the cheap form of stereoscopes on the market is the fixed position of the centres of the lenses. True, many of the better-class have these adjustable, but each lens requires to be moved separately so as to arrive at the proper centre. With adjustable centres, many more observers have the power of appreciating the beauty of stereoscopic effect.



Mr. Baird claims for his stereoscope, and this claim is amply borne out, that in his invention the centres of the lenses are adjustable, and that simultaneously; that it is so designed as to admit of the eyes coming close to the lenses. Lenses of various foci may be used, and the whole arrangement takes kindly to the face.

MOUNTING, TITLING, AND PLATE-MARKING IN ONE OPERATION.

Apropos of the subject of plate-making, we are reminded of a method of mounting we saw in practice in a Continental establishment, that did a large publishing business a year or two ago. By that method the prints were mounted on India paper, titled, and plate-marked at a single operation, while all cockling of the mounts, however thin, was avoided. The method was this: The prints were starched at the back and allowed to dry. They were then trimmed. The India paper, cut to size, was then damped and brushed at the back, as was also the mount on the front, as for copper-plate printing. A copper plate, bearing the title, was inked up in the usual way, and on it was laid the print, face downwards, on that the damp India paper, and on that the mount. The whole was then passed through a copper-plate press, and the operation was complete. Neither the print nor the mount was damped except by contact with the India paper, therefore there was no cockling whatever in the finished pictures.

ON THE CAUSE OF THE FADING OF ALBUMEN PRINTS.

Before the London and Provincial Photographic Association Mr. A. Haddon read the following paper on this subject. The discovery of the existence of so large an amount of 'printable' silver in the high lights of a photograph is an important and instructive one.

On August 3 last year, Mr. Grundy and myself contributed a paper to this Association on *The Amounts of Silver and Hypo left in Albumenised Paper at Different Stages of Washing*. The object of that research was to endeavour to find out how long, under given conditions, it was necessary to wash prints in order to eliminate all soluble salts; and, secondly, to ascertain, if any, the amount of silver left in paper after it had been washed for stated times.

I need not trouble you again with a description of the method we adopted, but have placed on the board the results we obtained. The point I wish to draw your attention to this evening with regard to that paper is that, after hypo and water have done their level best to dissolve out salts of silver and hypo, there is left in the paper a certain portion of the precious metal, which cannot be removed.

The weight of metallic silver in the paper after washing and previous to fixation was found to be ·0734 gramme per quarter sheet; after fixation and working, when the quantity became constant, the quantity was ·0037. By a simple rule of three we arrive at the result that five per cent. of the insoluble salts of silver in the high lights, previous to fixing and washing, remains in those parts.

A sheet of paper measures 22 × 17 inches, and has left in it ·0037 × 4 = ·0148 gramme, or a little less than a quarter of a grain of metallic silver. This does not seem a large amount when spread over 374 square inches, the area of a sheet the above dimensions, and its thickness would not exceed the $\frac{1}{4000000}$ of an inch. Some idea may be formed as to what this thickness means if we compare it with the thickness of gold leaf. One grain of gold, by mechanical means, can be made to cover fifty-six square inches; its thickness is then $\frac{1}{282000}$ of an inch, so that the thickness of the silver would be about $\frac{1}{14}$ of the thickness of gold leaf.

The thickness of the silver being so small, it would, at first sight, seem incapable of producing any visible effect, *i.e.*, stopping light when placed on a white surface.

In order to test by chemical means the existence of silver in the albumen, I took a print that had been produced over four years, and to all appearance had not changed. This was divided into two portions, and to one of these a solution of sulphuretted hydrogen was applied; almost at once the whites changed to a yellowish brown. Freshly prepared paper, fixed and washed, changes in identically the same manner.

The yellowing of prints is frequently ascribed to the combined action of light and moisture. Light I find to produce a bleaching action instead of a darkening or yellowing. In order to test this, I placed a piece of fixed and washed paper behind a circular opening cut in a piece of black paper, placed them in a printing frame, and exposed them to light. At the end of a few hours the exposed portion was perceptibly lighter than it was before, and at the end of eleven days, during which time the sun was shining on the paper, there seemed to be no further blackening. From this I conclude that light plays no part in the yellowing or change of colour in prints which have been as completely fixed as our present mode of operating will allow as to remove the sensitive silver compounds.

Judging from the specimens in the show-cases of photographers on the coasts, it would seem that sea salt, combined with moisture and heat, produces rapid yellowing of the high lights of prints. In order to test this, I soaked a piece of paper in a dilute solution of common salt, absorbed the surface moisture by means of blotting-paper, and placed it side by side with another piece of similar paper, excepting that the latter had not been treated with salt, in a wide-mouthed bottle containing a small beaker of water.

At the end of six days no perceptible difference was noticeable between the two pieces.

Unsensitised albumenised paper turns yellow when exposed to the action of ammonia, gas, and water. This may account for the fact that fumed paper alters to this colour, independent of the presence of silver salts. The yellowing of prints in the high lights might therefore take place, under certain conditions, though no silver be present in the paper.

Photographers are, as a rule, practical men, and do not care much about figures or a simple chemical reaction, and to tell a practical photographer that five per cent. of the insoluble salts, before fixing, are left in the high lights of the paper when the picture is complete, does not convey much information, nor yet does it convey to many any idea of the amount of silver present when they are shown a yellow stain produced by sulphuretted hydrogen or one of the alkaline sulphides. The two following experiments, however, I think, will appeal more forcibly to the minds of practical men, as they can be carried out by any one who will take the trouble. In the one case the metallic silver itself can be extracted from the paper and brought to view, and, in the other, the usual colouration due to light shown.

In order to extract the metallic silver from the fixed and washed paper, I took a quarter of a sheet, tore it to pieces, placed it in a beaker, then added some strong hydrochloric acid and water, saturated the whole with common salt, heated the contents of the beaker to about 50° C. for a quarter of an hour, and filtered the solution warm. Hydrochloric acid and common salt are both, to a small extent, solvents of salts of silver, especially in concentrated solutions. If there be present in the paper any salt of silver, it will be dissolved by these two bodies. The clear solution, after filtration, was boiled for a short time to expel the greater portion of the hydrochloric acid, and a piece of clean, bright copper was added, and heat again applied. After about a couple of hours' boiling, the copper foil was covered with a layer of metallic silver sufficiently thick to completely mask the reddish colour of the copper below. This, I think, would be a very good method to test qualitatively as to whether any particular system of working yielded prints the high lights of which are absolutely free from silver compounds. All that would be necessary to be done would be to fix and wash at the same time with the prints a piece of sensitised paper that had not been exposed to light, and then to treat this test paper as described above. If the amount of silver in a quarter sheet was only one quarter of what was found by analysis, it would, I think, give clear indications of a silver deposit on the copper.

There are many other methods that could be adopted, but this one requires no particular skill and does not involve the use of poisonous materials or materials that do not already exist on the shelves of all photographers.

The next method, that of printing out an image on the silver left in the high lights, is perhaps the most conclusive of all of the real existence of a silver compound left in the high lights of finished prints. In order to do this, the paper, after being fixed and washed, was soaked in chlorine water for about five minutes. The object of this was to decompose the salt or salts of silver in the paper, and convert them into silver chloride; but, as you are well aware, silver chloride prepared under such circumstances darkens but feebly under the action of light, and in order therefore to make it sensitive it is necessary to bring into contact with it during exposure some chlorine absorber; the most handy substance was nitrite of potassium. I mixed a two per cent. solution of this salt, and, after washing out all the chlorine, brushed this over the surface of the paper. I expected to see a very feeble image produced on exposure to light, but the density of the image will, I think, astonish all who see it. It printed up to the density you see in sunshine in about ten minutes. From the analysis of the paper it was impossible to say whether silver was in the pulp of the paper or in the albumen. In order to test this point, I applied the nitrite to both sides of another piece of paper, and, before exposure under the negative, folded back a portion so that albumen came in contact with albumen. When this was placed in contact with the negative, the light could act directly on the albumen of one part of the paper, and on the paper of the folded portion, so that, if silver existed in both albumen and paper, an image would be produced on each, and, if on the albumen only, the image would be limited to the albumen surface. The action of the light was to produce an image on the albumen only, and, where the two albumen surfaces came into contact with each other, then we have on opening the paper the one image reversed as regards the other. Such an image can be washed and fixed in the ordinary way without great loss of vigour.

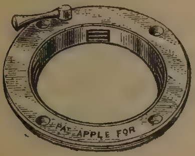
With such evidence before us of the existence of a sufficient quantity of silver in the high lights of albumen prints to produce such distinct images as I have shown, is it astonishing that silver prints, after a very short time, turn yellow and then fade? It would be marvellous if silver prints on albumenised paper did not turn yellow when we consider the impurities in the shape of sulphur compounds that exist in the atmospheres of large towns, in consequence of the enormous quantities of coal daily consumed. Coal, on an average, contains about one per cent. of sulphur, and some of this, when the coal is burnt, exists in our atmosphere as sulphuretted hydrogen. Effects we are able to produce in a few seconds when using a solution of sulphuretted hydrogen require many minutes when the gas is used, and months or years when the prints are exposed to impure air; but, though the action is slow in the case of sulphur-contaminated air, it is sure, and the silver that is there must finally be converted into sulphide; and it is this silver sulphide, I think, which is the true cause of the yellowing of the high lights of prints.

Mr. Grundy and myself have for some time past been working at the elimination of this last trace of silver from the albumen surface, but up to the present, I am sorry to say, with little success. We have tried hypo, strong, weak, hot, cold, and associated with other bodies. The paper, after fixing in the ordinary way, has been subjected to different reagents, and again fixed, but in all cases this quarter grain of silver per sheet remains, and will not be displaced. Ammonia and carbonate of ammonia have been recommended as additions to the hypo bath, but, even with these, we find little if any diminution in the quantity of silver left behind. Treating the paper with hydrochloric acid and common salt after fixation, washing, and again fixing, seemed to give the best results; but whether this method could be applied in the case of photographs we are not prepared to say, the image might be too much affected by the hydrochloric acid to be of any value practically. Sulphocyanide of potassium is no better fixing agent than hypo. Chloride of ammonium leaves a very large quantity of silver in the paper. Chloride of magnesium, which has been recommended, also leaves much silver.

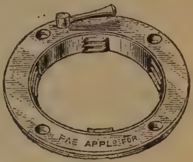
If each photographer would only make up his mind, and do a little work in the direction of eliminating the last trace of silver in the high lights of albumen prints, I have not the least doubt that we should soon have a perfect fixing agent for albumenised paper, and then the image, consisting only of silver and gold, when required, would stand the test of time much better than our silver prints of to-day do. We must, I fear, never hope to obtain images made up of two metals to stand as well as those built up of single metals. Silver prints toned with gold will never last as long as platinum images, but they will, if perfectly fixed, stand as long as any ordinary mortal will last, and, if we can achieve that, we shall have done much.

WATSON'S 'INSTANTANEOUS' LENS FLANGE (PATENT APPLIED FOR).

THIS ingenious idea entirely dispenses with the operation of screwing lenses into their flanges, and this overcomes the trouble of crossed threads, that frequently results when screwing up large lenses with fine threads, besides economising the photographer's time. It is only necessary to place the lens in position inside the flange, and turn the pin to the opposite side, throwing out four jaws which clamp the thread of the lens.



Open.



Closed.

MERCURIC CHLORIDE SOLUTION.

MONS. E. BURCKER, who has made a study of the decomposition undergone by chloride of mercury when in dilute solution, publishes his results in a paper in the *Comptes Rendus.* Although made with dilute solutions, it may be presumed that the same changes go on to a lesser extent in the concentrated solutions employed by photographers for intensification, and, no doubt, account for some of its anomalies so frequently met with in that process. The author finds that solution of mercuric chloride made in ordinary water undergoes a gradual decomposition, due to the simultaneous action of light, air, and the inorganic and organic impurities present in the water. In the dark, these decompositions do not take place, nor do they do so if distilled water be employed for solution of the mercury salt. The moral to photographers requires no pointing.

NOVEL METHODS IN PHOTOMETRY.

THE determination of the times of exposure of a photographic plate which are required to produce the same density of film when exposed to different light sources forms the basis of the methods recently adopted by Dr. Janssen for investigating the brightnesses of the heavenly bodies (*Bull. Mens. Soc. Ast. de France*, February). In the case of stars, the plate is placed a little within the principal focus of a telescope, so that a disc, or 'stellar circle,' replaces the almost point-like image ordinarily obtained; a series of exposures is made on one star, and another series on the star to be compared with it; the two images of the same density are thus identified, and the photographic brightnesses of the two stars are inversely as the durations of the corresponding exposures. To compare the light of a star with the sun, an opaque screen, pierced with holes of the same size as the stellar circles, is placed in front of the photographic plate, and these holes admit sunlight to the plate at the moment a triangular aperture in another metal plate is passed over them on releasing a spring ; in this way a series of circles of increasing intensity is impressed on the plate, and can be compared directly with the stellar circles. In its application to nebulæ, Dr. Janssen's method promises to be of great value. On the same plate which has been exposed to a nebula, a series of 'stellar circles' is formed by directing the instrument to a star in the neighbourhood which shows no signs of variability. In the future, when one wishes to obtain a photograph of the nebula which will be strictly comparable to one taken previously, it will only be necessary by means of stellar circles to determine the exact exposure which should be given. From an inquiry into the photographic luminosity of the tail of comet *b*, 1881, Dr Janssen finds that the intensity decreased in a ratio between the fourth and sixth power of the distance from the nucleus.—*Nature.*

TONING ALBUMEN PRINTS AFTER FIXING.

L'Amateur Photographe recommends the following formula, which is said to give black tones :—

Ammonium sulphocyanide	30 parts.
Gold chloride	3 ,,
Caustic potash	3 ,,
Water	1000 ,,

SULPHITE OF SODA IN THE TONING BATH.

FOLLOWING out some experiments we made during the early part of last year, we now have pleasure in suggesting a slight modification of our toning formula, for use under certain conditions, where the necessity for the addition may be indicated by results. The modification consists simply in the addition of 2 grains of sulphite of soda to the 16 ounce toning bath as per formula. By its use any tendency to double toning is avoided, if such tendency is by any chance present. With Ilford P.O.P. this tendency is practically absent if the toning bath, &c., are in proper condition and our instructions carefully followed. The addition of the sulphite is most useful, and is specially advisable with Ilford Special P.O.P., which tones very rapidly. The action of the sulphite is to slow the toning and put it under more easy control, and with both papers it enables warm tones of all shades, perfectly even all over, to be obtained, if the prints are withdrawn at early stages of the toning. Judging the progress of the toning is done as usual by examining the prints by transmitted light. Care must be taken not to add a single grain of the sulphite more than mentioned, or toning will be stopped entirely. The addition of the sulphite does not in any way impair the keeping qualities of the bath for use a second time. The best way to make the addition is to dissolve 160 grains of sulphite of soda in 10 ounces of water, and add 1 drachm of this solution to the 16 ounces of toning bath.—*Photographic Scraps.*

FORMULÆ.

DEVELOPING FORMULÆ.

METOL.

SINGLE-SOLUTION DEVELOPER.

Metol	40 grains.
Sulphite of soda	120 ,,
Hydroquinone	48 ,,
Carbonate of potash	240 ,,
Water	8 ounces.

Apply heat if necessary to dissolve the metol, and afterwards add the sulphite, and allow that to dissolve before adding the other ingredients.

For use under normal conditions, one part of the above is to be diluted with three parts of water.

TWO-SOLUTION DEVELOPER.

A.	Metol	40 grains.
	Hydroquinone	48 ,,
	Sulphite of soda	120 ,,
	Water	8 ounces.
B.	Carbonate of potash	1 ounce.
	Water	1 quart.

For use, mix one part of A with three parts of B for ordinary exposures; for over-exposures use less of B, or else add a few drops of a ten per cent. solution of bromide of potassium, or of a five per cent. solution of citric acid; for slight under-exposure, increase B.

THREE-SOLUTION FORMULA.

A.	Metol	40 grains.
	Sulphite of soda	120 ,,
	Water	8 ounces.

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B.	Hydroquinone	40 grains.
	Citric acid	10 ,,
	Water	8 ounces.
C.	Carbonate of potash	1 ounce.
	Water	20 ounces.

For use under similar conditions to those already mentioned, take one part each of A and B and two parts of C.

If required for use with plates of the more rapid type, or such as are difficult to work up to density, the proportion of B to A may be increased, as, for instance, making the mixture one part of A to two each of B and C. In some instances a better result is obtained by increasing the proportions of A and B equally, keeping C the same, say one and a half part to each of A and B to two parts of C.

METOL-HAUFF.

Solution A.

Water	100 parts.
Metol	1 part.
Soda sulphite	10 parts.

Solution B.

Water	100 parts.
Carbonate potash (or substitute)	10 ,,
Crystallised carbonate soda	20 ,,

For use, three parts A to one of B, with 40 minims of bromide of potassium solution (1 : 10).

METOL-ANDRESEN.

The formula for development issued with Metol-Andresen is as follows :—

Water	1 quart.
Metol	$\frac{3}{4}$ ounce.
Sulphite of soda	7 ounces.
Carbonate of potash	$3\frac{1}{2}$,,
Bromide of potassium	$\frac{1}{10}$ ounce.

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To photographers who prefer to work with separate solutions the following is recommended:—

A.	Water	1	quart.
	Metol	¾	ounce.
	Sulphite of soda	7	ounces.
B.	Water	3	quarts.
	Carbonate of soda	7	ounces.

Of these one part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

ANDRESEN'S GLYCIN.

The directions for using Dr. Andresen's glycin are as follows:—

I. For soft development:

Solution A (warm slightly).

Glycin	4	parts.
Carbonate of potash	1½	,,
Sulphite of soda (cryst.)	12	,,
Water	100	,,

Solution B.

Carbonate of potash	10	,,
Water	100	,,

For use mix one part of *A* with two parts of *B*.

II. For hard development:

Glycin	5	parts.
Carbonate of potash	25	,,
Sulphite of soda (cryst.)	25	,,
Water	100	,,

For use to be diluted three times its volume.

GLYCIN-HAUFF.

The concentrated developer is made up as follows:—350 grains of sodium sulphite crystal are dissolved in one ounce of water, 150 grains of glycin are then added and heated to boiling point, and one and a half ounces of potash carbonate are added (begin adding the potash in small

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quantities, on account of the carbonic acid gas). When cold, this concentrated developer—forming a thin, pasty solution—may be kept as stock. For use, shake the solution first, and dilute the required quantity twelve times for ordinary purposes. For use when development is to be left to itself the stock solution is diluted fifty times.

A ONE-SOLUTION FORMULA.

Sodium sulphite	40	grains.
Glycin	20	,,
Potassium carbonate	80	,,
Water	4	ounces.

PARA-AMIDOPHENOL.

Para-amidophenol chlorhydrate	5	grammes.
Crystallised carbonate of sodium	50	,,
Crystallised sulphite of sodium	50	,,
Water	1000	,,

For use, dilute with an equal bulk of water.

Para-amidophenol hydrochlorate	60	grains.
Sodium sulphite	60	,,
,, carbonate	400	,,
Water	20	ounces.

DR. ANDRESEN'S FORMULA.

Para-amidophenol chlorhydrate	8	parts.
Sodium sulphite	80	,,
,, carbonate	40	,,
Water	1000	,,

AMIDOL.

Amidol	80	grains.
Sodium sulphite	800	,,
Water	8	ounces.

For use, one ounce of the solution is diluted with three ounces of water, with one and a half grains of potassium bromide to the ounce of developer.

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Other Sizes at Proportionate and
Uniform Rates.

AMIDOL-HAUFF.

The following are the official instructions for the use of Amidol-Hauff:

I.—CONCENTRATED STOCK SOLUTION.

Water	7 ounces.
Sodium sulphite, cryst., pure	1½ ,,
Amidol	60 grains.

May be kept for a long time in full bottles well corked.

For use, mix one ounce of this concentrated solution with three ounces of water, and according to the make of the plates, add a small quantity at most twenty drops, of potassium bromide (1 : 10). In this state the solution may be used four or five times successively, without much loss of developing power, but it is not advisable to leave the developer standing too long, or to prepare more of it than necessary for the work in hand.

For landscapes, or strongly lighted subjects, the developer may be employed in a still more diluted form.

II.—TWO-SOLUTION DEVELOPER.

Water	20 ounces.
Sodium sulphite, cryst., pure	1 ounce.

This solution will keep for any length of time.

For use, eight to ten grains of amidol powder and a few drops of potassium bromide (1 : 10) are added to four ounces of the above solution. To be saved the trouble of frequent weighings, keep a little horn or bone spoon for measuring the required quantity of amidol. To retard development, use a ten per cent. solution of bromide, and to accelerate it add a twenty per cent. solution of sodium sulphite. On very hot days, or for plates inclined to fog, it is recommended to add a few drops of citric acid (1 : 10). With normal exposures the image should appear in from eight to ten seconds, and be fully developed in about four minutes. Over-exposure is recognised by the immediate appearance of the picture, in all its details, as soon as the developer is applied, the deep shadows becoming veiled, and all more or less fogged. For over-exposure it is necessary to use a weak developer, and to increase very largely the quantity of bromide, using, in extreme cases, even up to one-quarter bulk of the amidol solution. In every case of unknown exposure it is advisable to begin with a weak developer, or one which has done duty before, and increase the strength, when, from first indications, it is found safe to do so. For under-exposures, a strong developer or a large addition of the sulphite is

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recommended, and these also help to give greater density, which end may likewise be secured by prolonging the development. The degree of intensity is best judged of by transmitted light, remembering always to make allowance for reduction in the fixing process.

III.—SPECIAL DEVELOPERS.

Solution A.

Water	20 ounces.
Potassium metabisulphite	2 ,,
Amidol	1 ounce.

This solution will keep for a very long time if well corked.

Solution B.

Water	20 ounces.
Soda crystals	2 ,,

Solution C.

Water	20 ounces.
Sodium sulphite, cryst., pure	4 ,,

Results similar to pyro may be obtained with

Solution A	10 parts.
,, B	6–10 ,,
Water	70 ,,
Bromide (1 : 10)	3 ,,

But this formula may be considerably modified, according to requirements; it is not, however, advisable to increase the quantity of alkali, for fear of inducing fog.

For over-exposed plates, add the solution B in the above formula little by little, until the desired effect is obtained, never exceeding the amount above prescribed.

Images of a softer character are obtained as follows:—

Solution A	10 parts.
,, B	20–40 ,,
Water	70 ,,
Bromide (1 : 10)	½–¾ part.

IV.—SEPARATE DEVELOPER.

Solution D.

Water	20 ounces.
Sodium sulphite, pure cryst.	⅖ ounce.
Amidol	2 ounces.

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This solution keeps colourless for a long time in full and air-tight vessels. When opened it goes from yellow to red, which, however, does not affect the developing power, or colouration of plates.

Solution C.

Water	20 ounces.
Sodium sulphite, pure cryst.	4 ,,

For use take—

Solution D	5 parts.
Water	50–70 ,,
Solution C	20–30 ,,
Bromide (1 : 10)	1½ ,,

This formula also has the advantage, by gradually adding solution C, of controlling development up to the point desired, which is specially important for over-exposed plates.

As the image loses on fixing it is recommended to develop more strongly.

For Bromide Paper.

Both for prints and enlargements either of the above formulæ may be used, and the freedom from stains will prove of great advantage. With diluted solutions clear grey tones are obtained.

For Chloride Plates and Lantern Slides.

Transparencies of the blackest tones are developed with :—

Water	20 ounces.
Sodium sulphite, cryst., pure	1 ounce.
Amidol	40 grains.

Warmer tones are obtained through longer exposure and the liberal addition of bromide, even up to one ounce in the four ounce developer.

EIKONOGEN.

No. 1.	A.	Crystalline sulphite of soda	40 grammes.
		Eikonogen	3 ,,
		Distilled water	500 c.cm.
	B.	Carbonate of potash (or calcined soda)	60 to 75 grammes.
		Distilled water	500 c.cm.

For use, mix equal volumes of A and B.

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No. 2. A. Four parts sulphite of sodium are dissolved in sixty parts of water. To this solution add one part of crystallised eikonogen, which has been previously finely powdered by means of a mortar, and dissolve by shaking. Should a mortar be wanting, the solution can also be prepared in the following manner:—To four parts sulphite of sodium and one part eikonogen, which are placed either in an earthen or enamelled vessel, ten parts water are added, and the dissolution brought about by boiling and stirring. The hot solution is then poured into a flask containing fifty parts cold water.

B. Three parts crystallised carbonate of soda are dissolved in twenty parts cold water. Immediately before developing mix three parts of solution No. 1 with one part of solution No. 2.

FOR INSTANTANEOUS PHOTOGRAPHS WITH HAND CAMERAS (ABOUT $\frac{1}{50}$TH OF A SECOND EXPOSURE).

No 3. For this purpose Formula No. 1 is to be used, with the exception that for the crystallised carbonate of soda is substituted the same quantity of carbonate of potassium.

FOR VERY SHORT INSTANTANEOUS EXPOSURES, AND FOR INCREASING THE POWER OF THE DEVELOPERS NOS. 1 AND 2 IN CASES WHERE THE PLATE HAS NOT BEEN SUFFICIENTLY EXPOSED.

No. 4. Five parts sulphite of sodium, two parts carbonate of potassium, and one part eikonogen, are placed in an earthen or enamelled vessel, and to these are added thirty parts water, the dissolution being brought about by boiling and stirring. After having been allowed to cool, the developer, which is now ready for use, is preserved in a tightly closed bottle. The developer, if it has been prepared exactly according to the above method, keeps in good condition for a long time.

FIXING BATH FOR PLATES WHICH HAVE BEEN DEVELOPED WITH EIKONOGEN.

Plates which have been developed by means of eikonogen should be well washed, and will greatly benefit by being fixed in a bath composed of four parts hyposulphite of soda, one part bisulphite of soda, twenty parts water. The advantages of fixing in this bath are that (1) the negatives have a perfect tone, which enables very fast printing; (2) the new fixing bath remains, even after frequent usage, clear and water-white; (3) the plate need not be bathed in a solution of alum before fixing, and it is therefore not possible that the plate should be covered with a white layer in consequence of insufficient rinsing. Should the

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nature of the plate require that the coating be hardened, then there is no objection to an alum bath being used either before or after fixing, yet the quantity of alum added must not exceed one part to each twenty parts of water, as a stronger solution might cause the gelatine to blister. The bisulphite of soda can be replaced by ordinary neutral sulphite of soda (the same as is used when developing with eikonogen), provided that the bath be acidulated by means of a little sulphuric acid. In this case it should be made up in the following manner:—Dissolve twenty parts hyposulphite of soda and five parts neutral sulphite of soda in one hundred parts water, to which add slowly one part concentrated sulphuric acid. This bath, if properly prepared, answers the same purpose as the other, also remaining clear and water-white.

Formula for Developing Gelatine-Bromide Paper with Eikonogen.

The paper, having been exposed to the light, is soaked in forty parts water. The paper is hereupon taken out, and ten parts of a solution prepared according to Formula 3 are added to the bath. Should the picture be slow in appearing, and the details not be perceptible, then add gradually a further quantity of solution 3. If the paper has been exposed too long, only a small quantity of solution 3 must be used from the commencement. The addition of bromide of potassium is often the cause of the details not being forthcoming; it should therefore not be employed. After developing, the picture should be well washed, and then placed for several minutes in an alum bath, whereupon it is again washed and fixed.

The crystallised soda employed in formula need not be pure, but the same quality that is used in every household.

Gottheil's One-Solution Developer.

Sulphite of soda in crystals	8 ounces.
Carbonate of soda in crystals	3 ,,
Distilled water	80 ,,
Eikonogen	1 ounce.

HYDROQUINONE.

Although somewhat diversified in composition and proportion, the following are each employed and recommended by successful workers:—

No. 1.	Hydroquinone	1 part.
	Sulphite of soda	2 parts.
	Carbonate of soda	10 ,,
	Water	67 ,,

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No. 2.	A.	Hydroquinone	4 grains.
		Meta-bisulphite of potash	4 ,,
		Bromide of potassium	1 grain.
		Distilled water	1 ounce.
	B.	Potassium hydrate	10 grains.
		Distilled water	1 ounce.

Equal parts of A and B.

With some plates the bromide may be omitted.

No.	A.	Hydroquinone	80 grains.
		Citric acid	10 ,,
		Sulphite of soda (recrystallised)	80 ,,
		Distilled water	20 ounces.
	B.	Caustic potash (fused)	160 grains.
		Sulphite of soda	160 ,,
		Distilled water...	20 ounces.
	C.	Bromide of potassium	24 grains.
		Distilled water	1 ounce.
	D.	Caustic potash	160 grains.
		Distilled water	20 ounces.

For normal exposures use equal parts of A and B, adding five minims o C for every ounce of solution.

For over-exposed plates use D instead of B, with an extra quantity of C.

For under-exposed plates omit C, and in extreme cases add six or eight grains more of sulphite of soda to each ounce of the developer. The object of increasing or decreasing the quantity of sulphite is to give greater or lesser density.

No. 4.	A.	Hydroquinone	160 grains.
		Sulphite of soda	2 ounces.
		Citric acid	60 grains.
		Bromide of ammonium	20 ,,
		Water to	20 ounces.
	B.	Carbonate of potash	2 ounces.
		Carbonate of soda (crystal)	2 ,,
		Water to	20 ,,

Take equal parts.

No. 5.	A.	Hydroquinone	15 grains.
		Sulphite of soda	75 ,,
		Water	5 ounces.

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Plates of QUADRUPLE Speed
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B.	Carbonate of potash	90 grains.
	Water	5 ounces.

C. Ten per cent. solution of bromide of potassium.

Use equal parts of A and B, and add two or three minims of C. With some plates no bromide restrainer will be required.

No. 6.	Sulphite of soda	40 grammes.
	Hydroquinone	5 ,,
	Carbonate of soda	75 ,,
	Water	200 c.c.

For use, dilute ten c.c. with water to thirty-five c.c.

For a single stock solution prepare as follows :—

No. 7.	A.	Hydroquinone	50 grains.
		Meta-bisulphite of potash	80 ,,
		Water	4 ounces.
	B.	Carbonate of potash	840 grains.
		Water	4 ounces.

Filter solution B, and then mix A and B.

For use, take half an ounce of this solution and add to five ounces of water. The picture takes perhaps rather longer to appear, but gradually and evenly works up to the required density. If the plate should prove to have been over-exposed, add a little water to the developer, but avoid the use of bromides. Some may prefer to keep the solutions separate, when they would keep indefinitely; in this event prepare as follows :—

No. 8.	A.	Hydroquinone	15 grains.
		Meta-bisulphite of potash	20 ,,
		Water	1 ounce.
	B.	Carbonate of potash	180 grains.
		Water	20 ounces.

For use, add two drachms of A to five ounces of B. Plates can be developed in the same solution one after another, even after it has attained the colour of light port wine.

No. 9.	Bitartrate of potash	90 grains.
	Sulphite of potash	45 ,,
	Carbonate of potash	4 ounces.
	Water	16 ,,
	Filter, and add—	
	Hydroquinone	½ ounce.

For use, one part is diluted with sixteen parts water.

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For Truthful Rendering of Colour.
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No. 10.	Carbonate of soda	4½ ounces.
	Sulphite of soda	2½ ,,
	Hydroquinone	150 grains.
	Water	36 ounces.

When freshly prepared the bath is too strong, and should have a third of water added to it; afterwards, each time of using a certain quantity of new solution should be added. The solution is not filtered, the clear part is decanted off.

No. 11.	Citric acid	5 grains.
	Bromide of potassium	10 ,,
	Hydroquinone	60 ,,
	Sulphite of soda	120 ,,
	Water	10 ounces

Grind the hydroquinone in a mortar with warm water, then add the rest, and pass it on to the boy to be shaken till thoroughly dissolved; either filter, or allow to stand till clear. The alkali to be either caustic soda (four to six grains per ounce), or common crystals of soda (forty or fifty grains per ounce), or any chosen mixture of the two. Equal quantities of each for developing.

No. 12.	A.	Sulphite of soda	2½ ounces.
		Boiled water	16 ,,
	B.	Crystal carbonate of soda	¼ pound.
		Water (boiled)	20 ounces.
	C.	Hydroquinone	1 drachm.
		Rectified spirits of wine	2½ ounces.

Take half an ounce each of A and B, and add half a drachm of C.

If over-exposure occurs, add to this quantity, say, two or three drops of

Bromide of ammonium	200 grains.
Water	2 ounces.

For Chloride Plates.

No. 13.	Hydroquinone	2 grains.
	Sulphite of soda	10 ,,
	Carbonate of ammonia (or pot.)	10 ,,
	Bromide of potassium	$\frac{1}{10}$ grain.
	Water	1 ounce.

PYRO.

No. 1.	A.	Sulphite of soda	6 ounces.
		Hot water	32 ,,
		Pyrogallic acid	1 ounce.

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SPECIAL Lantern
. . Plates.

FAST, CLEAN, BRIGHT.

For Cold Tones.

FULL PRICE LIST FREE.

(Having dissolved the sulphite of soda, add sufficient citric acid in solution to cause a piece of blue litmus paper inserted therein to become reddened.)

B.	Carbonate of soda	3 ounces.
	Carbonate of potash	1 ounce.
	Water	32 ounces.

When about to develop, mix these in equal proportions with two parts the bulk of water, or, if the weather be *very* hot at the time, even a greater proportion of water.

No. 2.	A.	Sulphite of soda	4 ounces.
		Warm distilled water	4 ,,
		When cooled to 70° Fahr., add—	
		Sulphurous acid water (strongest to be had)	3½ ounces.
		Pyrogallol	1 ounce.
	B.	Carbonate of potash	3 ounces.
		Water	4 ,,
		Sulphite of soda	2 ,,
		Water	4 ,,

Mix separately, and then combine in one solution.

To make two ounces of developer, pour into the graduate one drachm of A (equivalent in all to six grains of pyro) and twenty minims or a quarter of a drachm of B, then fill the graduate to two ounces with water. If after two or three minutes no trace of the image appears in the brilliant high lights, add to the graduate twenty minims more of the potash solution, mix with the developer, and return to the plate. Do not exceed two and a half drachms of the alkaline solution.

FERROUS OXALATE.

No. 1.	Saturated solution of sulphate of iron	1 part.
	Saturated solution of oxalate of potash	3 parts.

Mix *quant. suff.* by pouring the iron into the oxalate. In hot weather the proportion of the iron solution may be diminished with advantage.

For Transparencies on Gelatino-Chloride Plates.

No. 2.	A.	Neutral oxalate of potash	2 ounces.
		Chloride of ammonium	40 grains.
		Distilled water	20 ounces.

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. . ALPHA . .
LANTERN PLATES.
PERFECT
For Warm Tones.
FULL PRICE LIST FREE.

B.	Sulphate of iron	4 drachms.
	Citric acid	2 ,,
	Alum	2 ,,
	Distilled water	16 ounces.

For black tones mix the above in equal volumes.

ORTHOCHROMATIC DRY PROCESSES.

F. E. Ives'.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and, as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyl from blue myrtle or plantain leaves, then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitises for all colours, including deep ruby red. A very light yellow screen is sufficient to secure correct rendering of colour tone.

V. Schumann's.

Soak the plate in 200 c.c. of water and 2 to 4 c.c. of ammonia for two to three minutes, then immerse in

Distilled water	200 c.c.
Alcohol	10 ,,
Ammonia	4 ,,
Alcoholic solution of cyanine, 1 : 500	10 ,,

Drs. Mallmann and Scolik's.

Preliminary Bath.

A.	Water	200 c.c.
	Ammonia	2 ,,

Soak the plate for two minutes.

Colour Bath.

Erythrosine solution, 1·1000	25 c.c.
Ammonia	4 ,,
Water	175 ,,

The plate should not remain longer in this bath than one and a quarter minute. A longer time depresses the general sensitiveness.

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P.O.P.
(Trade Mark.)
Printing Out Paper.
HAS NO RIVAL.
FULL PRICE LIST FREE.

Alcohol	500 c.c.
Chinoline red	1 gramme.

To which are added 50 c.c. of a solution of

Alcohol	500 c.c.
Chinoline blue (cyanine)	1 gramme.

The above solution is identical with the liquid dye sold under the me 'Azaline.'

THE WET-COLLODION PROCESS.

Pyroxyline (Hardwich).

Sulphuric acid 1·845 (fluid)	18	ounces.
Nitric acid 1·457 ,,	6	,,
Water (fluid)	5 to 5¼	,,
Cotton-wool	300	grains.

Temperature 150° Fahr. Time of immersion, 10 minutes.

Iodised Collodion (for Negatives).

For Acid Pyro Developer.

Ether, s.g. ·725	10	fluid ounces.
Alcohol, s.g. ·805	4	,,
Pyroxyline	120	grains.
Iodide of ammonium	30	,,
,, cadmium	45	,,
Alcohol ·830	4	fluid ounces.

Bromo-iodised Collodion (for Negatives).

Iron Developer.

Ether, s.g. ·725	10	fluid ounces.
Alcohol, s.g. ·805	5	,,
Pyroxyline	120	grains.
Iodide of ammonium	40	,,
,, cadmium	40	,,
Bromide of ,,	20	,,
Alcohol ·830	5	fluid ounces.

ILFORD P.O.P. (Trade Mark.)
White
Pink
Mauve
Special
Matt
FULL PRICE LISTS FREE.

Bromo-iodised Collodion (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	5 ,,
Pyroxyline	100 grains.
Iodide of cadmium	50 ,,
Bromide of ammonium	25 ,,
Alcohol ·830	5 fluid ounces.

Note.—The iodides should be dissolved in the weaker spirit and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

The Nitrate Bath (for Negatives)

Nitrate of silver (recrystallised)	6 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	8 minims.

Saturate with iodide of silver, then filter.

This is best done by coating a plate with collodion and leaving it in the bath for some hours.

(For Positives or Ferrotypes.)

Nitrate of silver (recrystallised)	5½ ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	½ drachm.

Saturate with iodide of silver and filter as above.

DEVELOPER.

For Negatives.

No. 1.	Ferrous sulphate	½ ounce.
	Glacial acetic acid	½ ,,
	Alcohol	½ ,,
	Water	10 ounces.
No. 2.	Ammonio-sulphate of iron	75 grains.
	Glacial acetic acid	75 ,,
	Sulphate of copper	7 ,,
	Water	4 ounces.
	Alcohol	¼ ounce,

ILFORD
Bromide Paper
SURPASSES
ALL OTHERS.
FULL PRICE LIST FREE.

For Collodion Positives or Ferrotypes.

Ferrous sulphate	150 grains.
Glacial acetic acid	½ ounce.
Nitric acid	5 minims.
Alcohol	½ ounce.
Water	10 ounces.

Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

Nitrate of Iron Developer for Positives.

Ferrous sulphate	1½ ounce.
Nitrate of baryta	1 ,,
Water	1 pint.
Alcohol	1 ounce.
Nitric acid	40 drops.

The insoluble sulphate of baryta which is formed must be filtered out.

Fixing Solution for Positives.

Cyanide of potassium	½ ounce.
Water	15 to 20 ounces.

For Collodion Transfers.

Pyrogallic acid	5 grains.
Citric acid	3 ,,
Acetic acid	20 minims.
Water	1 ounce.
Alcohol	20 minims.

PYROXYLINE FOR DRY-COLLODION PROCESSES.

For Collodio-bromide or Unwashed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces
Sulphuric acid, s.g. 1·845	4 ,,
Water	1 fluid ounce.
Cotton (cleaned and carded)	100 grains.
Temperature	150° Fahr.
Time of immersion	10 minutes.

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For Washed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	3 ,,
White blotting-paper	145 grains.
Temperature	100° Fahr.
Time of immersion	30 minutes.

COLLODIO-BROMIDE EMULSION.

Ether, s.g. ·720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 ,,
or Bromide of zinc	76 ,,

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

Washed Emulsion (for Landscapes).

No. 1.

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2¾ ,,
Pyroxyline	40 grains.
Castile soap (dissolved in alcohol)	30 ,,
Bromide of ammonium and cadmium	84 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and, after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2½ ,,
Pyroxyline	40 grains.
Castile soap	30 ,,
Bromide of ammonium and cadmium	56 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

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For Washed Emulsion (for Transparencies).

Ether, s.g. 720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline or papyroxyline	60 grains.
Bromide of cadmium and ammonium	100 ,,
or Bromide of zinc	96 ,,
Hydrochloric acid, s.g. 1·2	8 minims.

Sensitise with twenty grains of nitrate of silver to each ounce, dissolved in a minimum of water with two drachms of boiling alcohol. Allow to stand for two or three days.

N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

ORGANIFIERS (for Unwashed Emulsions).

For Landscape Work.

No. 1.	Tannin	½ ounce.
	Gallic acid	60 grains.
	Water	20 fluid ounces.
No. 2.	Tannin	300 grains.
	Water	20 fluid ounces.

For Landscapes or Transparencies (warm brown tone).

No 3.	Freshly ground coffee	1 ounce.
	Boiling water	1 pint.

For Transparencies (brownish-black tone).

No 4.	Tannin	30 grains.
	Pyrogallic acid	60 ,,
	Water	20 fluid ounces.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

Solution A.

Pyrogallic acid	96 grains.
Alcohol	1 fluid ounce.

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SOLUTION B.

Bromide of potassium	10 grains.
Water	1 fluid ounce.

SOLUTION C.

Liquor ammoniæ, s.g. ·880	1 fluid drachm.
Water	15 fluid drachms.

OR D.

Carbonate of ammonium	120 grains.
Water	1 fluid ounce.

For each drachm of developer take, for a normal exposure, five minims of A, one or two minims of B, and one or two minims of C; or, if D be used, add the above quantities of A, B, and C, to one drachm of D. When the details of the image are out, add double the quantities of B and C.

WELLINGTON'S COLLODIO-BROMIDE EMULSION FORMULÆ.

Pyroxyline	30 grains.
Ether	12 drachms.
Alcohol	12 ,,

To bromise, add 30 grains bromide ammonium dissolved in 45 minims water, to which 4 drachms of alcohol are afterwards added; 50 grains of nitrate of silver dissolved in a drachm of water are then added. After washing and drying, the pellicle is dissolved in $1\frac{3}{4}$ ounces of ether and $1\frac{2}{4}$ ounces alcohol.

DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water	18 ,,
No. 2.	Potassium carbonate	3 ounces.
	Sulphite of soda	2 ,,
	Water	18 ,,
No. 3.	Bromide ammonium	1 ounce.
	Water	10 ,,

Use equal parts of each without dilution.

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NESBIT'S FORMULÆ.

Pyroxyline	60 grains.
Methylated alcohol	2¾ ounces.
Ether	2¼ ,,
Bromide ammonium (in water 100 minims)	63 grains.
Alcohol	1 ounce.
Nitrate of silver	100 grains.
Water	60 minims.

After washing and drying, redissolve in alcohol 4 ounces, ether 4 ounces.

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

NEGATIVE REDUCERS.

FARMER'S.

Saturated solution of ferridcyanide of potassium	1 part.
Hyposulphite of soda solution, 1·5	10 parts.

L. BELITZKI'S.

Potassium ferric oxalate	1 to 10 grains.
Hyposulphite of soda solution, 1 to 5	1 ounce.

INTENSIFIERS.

MONCKHOVEN'S.

1. A. Bromide of potassium	10 grains.
Bichloride of mercury	10 ,,
Water	1 ounce.
B. Pure cyanide of potassium	10 grains.
Nitrate of silver	10 ,,
Water	1 ounce.

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Place the negative in A till it is white, then rinse and transfer it to solution B. If the intensification has been carried too far, it may be reduced by treatment with a weak solution of hyposulphite of soda.

2. A. Bichloride of mercury	1 ounce.
Chloride of ammonium	1 ,,
Potassic iodide	1 ,,

Dissolve the mercury and ammonium salts in ten ounces of water putting them both in together, and add sufficient of the strong iodide of potash solution; shake well, and make up to twenty ounces with water.

B. Silver nitrate	½ ounce.
Potassium cyanide, sufficient to dissolve out the first precipitate.	

Now make up this bulk to twenty ounces with water.

This solution should not be used at full strength when little density required, but diluted to half. The fixed and well-washed negatives should be placed in a dish containing the A solution, and gently kept in motion for a few seconds. Examine from time to time until it appears quite dense, take out and well wash again until the film is an even yellow all over, then place in a dish containing the B solution, and let remain until the film becomes a beautiful olive-brown, then lift out and set aside to dry.

HYPO ELIMINATORS, CLEARING SOLUTIONS, &c.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification:—

Schlippe's salt	10 grains.
Water	1 ounce.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

HYDROXYL.

Peroxide of hydrogen (twenty vols.)	1 drachm.
Water	5 ounces.

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&c., &c., &c.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

ANOTHER.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others:—

Barium dioxide	1 ounce.
Glacial acetic acid	1 ,,
Water	4 ounces.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

ALUM.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

EAU DE JAVELLE.

Dry chloride of lime (hypochlorite of lime)	2 ounces.
Carbonate of potash	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

LABARRAQUE'S SOLUTION.

Chloride of lime	2 ounces.
Carbonate of soda	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil, and filter.

CLEARING SOLUTIONS.

Alum	2 ounces.
Citric acid	1 ounce.
Water	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

ANOTHER.

Saturated solution of alum	20 ounces.
Hydrochloric acid (commercial)	1 ounce.

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Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

FORMULÆ FOR NEGATIVE VARNISHES.

No. 1.	Sandarac	4	ounces.
	Alcohol	28	,,
	Oil of lavender	3	,,

This is a good varnish for retouching upon, as a 'tooth' is easily obtained by rubbing.

No. 2.	White hard varnish	15	ounces.
	Methylated alcohol	20 to 30	,,

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

Tough, hard, and durable:—

No. 3.	Bleached shellac	1¼	ounce.
	Mastic	¼	,,
	Oil of turpentine	¼	,,
	Sandarac	1¼	,,
	Alcohol	20	fluid ounces.
No. 4.	Sandarac	80	ounces.
	Turpentine	36	,,
	Oil of lavender	10	,,
	Alcohol	500	,,

This one may be rubbed down with powdered resin, and gives splendid surface for retouching:—

No. 5.	Sandarac	1	ounce.
	Seed lac	1½	,,
	Castor oil	3	drachms.
	Oil of lavender	1½	drachm.
	Alcohol	18	fluid ounces.

This varnish is somewhat dark in colour.

IMPORTANT.

SEE PAGES - - 823 to 845

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No. 6.

Best orange shellac	2½ ounces.
Oil of lavender or oil of turpentine	¼ ounce.
Methylated alcohol	1 pint.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

Retouching Varnish.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

In the above formulæ the proportions of alcohol must be taken as approximate, as different samples of resins vary, some giving more viscous solutions than others.

Ground-Glass Varnish.

Sandarac	90 grains.
Mastic	20 ,,
Ether	2 ounces.

Dissolve the resins in the ether and afterwards add

Benzole	½ to 1½ ounce.

The proportion of the benzole added determines the nature of the matt obtained.

PERMANENT SENSITISED ALBUMEN PAPER.

1.—Sensitise the paper in the usual bath, drain well, and when superficially dry float the back of the paper for twenty minutes on a solution of

Citric acid	1 ounce.
Water	30 ounces.

Or,

2.—Sensitise as usual, drain well, and wash the paper in three or four changes of water, then float the back on a solution of

Nitrite of potassium	5 ounces.
Water	100 ,,

When dry, roll the paper up, coated side out, and wrap in blotting-paper soaked in the nitrite of potash solution, and dried.

GELATINO-CHLORIDE FOR PRINTING-OUT.

BARKER'S FORMULA.

Gelatine (Nelson's No. 1 and Coignet's, equal parts)	175 grains.
Chloride of ammonium	18 ,,
Rochelle salts	50 ,,
Nitrate of silver	75 ,,
Alcohol	4 drachms.
Water	5 ounces.

Heat to 100° Fahr., and allow to remain at this temperature after all is dissolved for ten minutes, after which proceed in the usual way.

TONING BATHS FOR THE FOREGOING.

Wash the prints in clean water and then *tone* in the following:—

1. A. Distilled water	25 ounces.
Acetate of soda (recrystallised)	1 ounce.
Into which pour a solution of 1 per cent. of chloride of gold	2 ounces.

B. In ten ounces of distilled water, dissolve two drachms of sulphocyanide of ammonium, and add one ounce solution of 1 per cent. chloride of gold.

For toning, mix in the proportion of twenty ounces of A to six of B, if possible the evening before using.

ANOTHER.

2. A. Water	3 ounces.
Chloride of gold	2 grains.
B. Water	3 ounces.
Sulphocyanide of ammonium	40 grains.
Hyposulphite of soda	1 grain.
Carbonate of soda	3 grains.

These are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

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TONING FORMULÆ FOR GELATINO-CHLORIDE PAPERS.

COMBINED TONING AND FIXING BATH FOR EASTMAN SOLIO PAPER.

No. 1.

Hypo	20 ounces.
Alum	5 ,,
Soda sulphate	10 ,,
Potash sulphate	2 ,,
Water	160 ,,

No. 2.

Gold chloride	15 grains.
Lead acetate	64 ,,
Water	8 ounces.

For use, eight ounces of No. 1 solution; one ounce of No. 2.

A red precipitate is thrown down in the gold solution, but, if shaken before addition to the hypo, it will be redissolved.

Formula for Blue Tones.

No. 1.

Borax	600 grains.
Water	160 ounces.

Our Sales:—

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THE REST.

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No. 2.

Gold chloride	15 grains.
Water	15 ounces.

For use, eight ounces of No. 1; half ounce of No. 2. The solutions must be kept separate.

Toning Bath for Ilford Printing-out Paper.

Water	16 ounces.
Sulphocyanide of ammonium	30 grains.
Gold chloride	2½ ,,

This *can* be used the moment it is made, but preferably it should stand twenty-four hours before use. The bath keeps indefinitely, and works better as it grows older.

A Combined Toning and Fixing Bath.

Water	20 ounces.
Hypo	5 ,,
Citric acid	60 grains.
Acetate of lead	60 ,,
Sulphocyanide of ammonium	240 ,,

These are added, and dissolved in the order given, and the solution allowed to stand for twenty-four hours. A precipitate will then be thrown down, and the clear solution decanted off. Then add—

Chloride of gold	3 grains.

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THE BRITANNIA WORKS COMPANY, Limited,
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TONING FORMULÆ FOR ALBUMEN PRINTS.

No. 1.	Chloride of gold	1 grain.
	Acetate of soda	30 grains.
	Water	8 ounces.

This must not be used till one day after preparation. It keeps well and gives warm, rich tones.

No. 2.	Chloride of gold	1 grain.
	Bicarbonate of soda	4 grains.
	Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

No. 3.	Chloride of gold	1 grain.
	Phosphate of soda	20 grains.
	Water	8 ouncs.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4.	Gold solution	10 drachms.
	Acetate of lime	20 grains.
	Chloride of lime	1 grain.
	Tepid water	20 ounces.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping.

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To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5.	Chloride of gold	15 grains.
	Water	5 ounces.

Neutralise with lime water, make up to fifteen ounces with water, and add two drachms of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

TONING AND FIXING IN ONE BATH.

No. 6.	Chloride of gold	1 grain.
	Phosphate of soda	15 grains.
	Sulphocyanide of ammonium	25 ,,
	Hyposulphite of soda	240 ,,
	Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

INGALL'S TONING FORMULA.

Hard water (fluid)	20 ounces.
Bi-carbonate of potash	20 grains.
Gold	2 ,,

= 2 drachms solution 1 grain to 1 drachm hard water.

Our Quality:—

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HIGHEST.

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'DUSTING-ON' FORMULÆ.

No. 1.	Saturated solution of bichromate of ammonium	5 drachms.
	Honey	3 ,,
	Albumen	3 ,,
	Distilled water	20 to 30 ,,
No. 2.	Dextrine	½ ounce.
	Grape sugar	½ ,,
	Bichromate	½ ,,
	Water	½ pint.
No. 3.	Gum arabic	6 parts.
	Bichromate of potash	2·5 ,,
	Grape sugar	4 ,,
	Water	72 ,,

MISCELLANEOUS FORMULÆ.

(*In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.*)

SILVERING MIRRORS (MARTIN'S METHOD).

A.	Nitrate of silver	175 grains.
	Distilled water	10 ounces.
B.	Nitrate of ammonium	262 grains.
	Distilled water	10 ounces.

Our Address :—

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C. *Pure* caustic potash	1 ounce (avoirdupois).
Distilled water	10 ounces.
D. Pure sugar candy	½ ounce (avoirdupois).
Distilled water	5 ounces.

Dissolve and add—

Tartaric acid	50 grains.

Boil in a flask for ten minutes, and when cool add—

Alcohol	1 ounce.

Distilled water *quant. suff.* to make up to 10 ounces.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains.
Boiling distilled water	1 ounce.
Glycerine	half a teaspoonful.
Treacle	half as much as glycerine.

TO RECOVER FOGGED PLATES.

Make a solution as follows :—

Chromic acid	30 grains.
Bromide of potassium	60 ,,
Water	10 ounces.

And immerse the plates for five minutes. Afterwards wash very thoroughly, and rear up to dry.

Or, instead of the above, make the following :—

Bichromate of potash	1 ounce.
Hydrobromic acid	2 drachms.
Water	10 ounces.

If hydrobromic cannot be obtained, use hydrochloric acid or a soluble bromide ; in the last case a few drops of sulphuric acid being added to the solution. Use as before.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ,,
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce.
Water	20 to 30 ounces.
Liquor ammoniæ	20 minims.

A strong solution should be used for hard negatives and a more dilute one for soft negatives.

WAXING SOLUTION.

For Carbon Prints, or for Removing Collodion Films.

No. 1.	Beeswax	20 grains.
	Benzole rect. No. 1	4 ounces.

For Flexible Supports (Autotype).

No. 2.	Yellow resin	3 drachms.
	Yellow beeswax	1 drachm.
	Rectified spirits of turpentine	10 ounces.

ALBUMEN PROCESS FOR TRANSPARENCIES.

Iodised Albumen.

Albumen	10 ounces.
Liquor ammonia	½ drachm.
Iodide of ammonium	50 grains.
Bromide of ammonium	10 ,,

Silver Bath.

Water	10 ounces.
Nitrate silver	1 ounce.
Glacial acetic acid	1 ,,

Coat the glass with old iodised collodion and when it has set wash under the tap, drain, and coat with the albumen. When dry, sensitise for 1 minute, wash, and again dry.

Developer.

Pyrogallic acid	30 grains.
Citric acid	20 ,,
Water	10 ounces.

Use warm (120° Fahr.) and add 2 or 3 drops of a 20-grain solution of nitrate of silver per ounce at the time of using. Fix in a solution of hyposulphite of soda 4 ounces to the pint. Tone with gold if the colour is too brown.

LUBRICANT FOR BURNISHING PRINTS.

Castile soap	20 grains.
Alcohol	10 ounces.

BACKING FOR DRY PLATES TO PREVENT HALATION (TEAPE'S).

Gum solution (ordinary office gum)	1 ounce.
Caramel	1 ,,
Burnt sienna, ground in water	2 ounces.
Mix and add alcohol	2 ,,

COLOUR FOR APPLYING TO BRIGHT MACHINERY PRIOR TO PHOTOGRAPHING IT.

Mix white lead with turpentine to the consistence of thin cream, with sufficient lampblack to form a light slate colour, and then add one-sixth the bulk of japanners' gold size. Paint the machinery over with this. After the photograph has been taken, the colour can be quickly removed with a pledget of 'cotton waste' moistened with turpentine or benzoline.

RETOUCHING MEDIUM.

Pale resin	1 ounce.
Oil of turpentine	1 ,,
Oil of lavender	2 ounces.

TO PREVENT BLISTERS IN ALBUMEN PRINTS (RICHMOND).

Before wetting the prints immerse them in methylated spirit, then wash and tone as usual.

TO REMOVE GELATINE NEGATIVES FROM THE GLASS.

Immerse the plate in water to which a few drops per ounce of hydrofluoric acid have been added. If the film expands, as most likely it will, immersion in spirit will bring it to its original dimensions.

GELATINE EMULSION PROCESSES.

W. K. BURTON'S FORMULA.

A.	Bromide of ammonium	260 grains.
	Iodide of potassium	20 ,,
	Gelatine (Nelson No. 1)	80 ,,
	Distilled water	10 ounces.
B.	Silver nitrate (dry)	200 grains.
C.	Silver nitrate	200 grains.
	Distilled water	1 ounce.
Converted to ammonio-nitrate.		
D.	Gelatine, hard (dry)	600 grains.

BURBANK'S FORMULA.

Water	1 ounce.
Bromide of ammonium	15 to 20 grains.
Or,	
Bromide of potassium	18 to 25 grains.
Nitrate of silver, proportioned to the amount of bromide	25 to 30 ,,
Gelatine	30 to 40 ,,

CAPTAIN ABNEY'S FORMULA.

1.	Potassium bromide	10 grains.
2.	Ammonium bromide	140 ,,
3.	Nelson's No. 1 gelatine	30 ,,
4.	Silver nitrate	200 ,,
5.	Nelson's No. 1 gelatine	80 ,,
6.	Coignet's special	80 ,,

CHARLES BENNETT'S FORMULA.

Ammonium bromide	70 grains.
Silver nitrate	110 ,,
Gelatine	200 ,,
Distilled water	6 ounces.

DR. EDER'S AMMONIA FORMULA.

1. Potassium bromide	370 grains.
Gelatine	520 to 700 ,,
Water	10½ ounces.
2. Silver nitrate	460 grains.
Water	10½ ounces.

Strong ammonia is added to No. 2 until the precipitate is just redissolved.

DR. VAN MONCKHOVEN'S FORMULA.

1. Hydrobromic acid (sufficient to dissolve 150 grains of silver nitrate).	
Gelatine	40 grains.
Water	7 ounces.
2. Silver nitrate	150 grains.
Bicarbonate of soda	*q.s.* to precipitate the carbonate.
3. Gelatine	30 grains.
Water (hot)	7 ounces.

Nos. 2 and 3 are mixed and then No. 1 added, 150 grains of gelatine being finally introduced.

A. L. HENDERSON'S FORMULA.

Silver nitrate	120 grains.
Water	3 ounces.
Potassium carbonate	60 to 90 grains.
Water	3 ounces.
Potassium bromide	90 grains.
,, iodide	1 grain.
Gelatine	20 grains.

Formula for Gelatino-bromide Emulsion.

Ammonium bromide	75 grains.
Gelatine	10 ,,
Silver nitrate	120 ,,
Nitric acid	½ minim.
Water	4½ ounces.

For Gelatino-bromo-Chloride.

Ammonium bromide	65 grains.
,, chloride	5 ,,
Gelatine	10 ,,
Silver nitrate	120 ,,
Nitric acid	½ minim.
Water	4½ ounces.

For Gelatino-bromo-Iodide.

Potassium bromide	84 grains.
,, iodide	5 ,,
Gelatine	10 ,,
Silver nitrate	120 ,,
Nitric acid	½ minim
Water	½ ounces.

RATES OF POSTAGE FOR INLAND LETTERS.

THE rates of postage to be prepaid are as follow, viz. :—

For a letter not exceeding 1 oz.					1*d.*
,,	exceeding	1 oz.,	but not exceeding	2 ozs.	1½*d.*
,,	,,	2	,, ,,	4 ,,	2*d.*
,,	,,	4	,, ,,	6 ,,	2½*d.*
,,	,,	6	,, ,,	8 ,,	3*d.*
,,	,,	8	,, ,,	10 ,,	3½*d.*
,,	,,	10	,, ,,	12 ,,	4*d.*
,,	,,	12	,, ,,	14 ,,	4½*d.*

And so on at the rate of ½*d.* for every additional two ounces.

INLAND PARCEL POST.

EVERY Post Office is open to the public for Parcel Post business on Week Days during the same hours as for general postal business. On Sundays Parcel Post business is not transacted.

RATES OF POSTAGE AND WEIGHT.—Three-halfpence for each pound after the first, which is threepence.

PREPAYMENT OF POSTAGE.—All parcels must be prepaid. LIMITATION OF WEIGHT.—No Parcel exceeding 11 lbs. in weight can be received for transmission by Parcel Post. LIMITATION OF SIZE.—No Parcel may exceed 3 ft. 6 in. in length, or 6 ft. in length and girth combined. POSTING OF PARCELS.—Parcels must be handed in at a Post Office Counter, and must not be dropped into a Letter Box.

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains = 1 Scruple = 20 Grains.
3 Scruples = 1 Drachm = 60 ,,
8 Drachms = 1 Ounce = 480 ,,
12 Ounces = 1 Pound = 5760 ,,

FLUID.

60 Minims = 1 Fluid Drachm.
8 Drachms = 1 Ounce.
20 Ounces = 1 Pint.
8 Pints = 1 Gallon.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by Avoirdupois Weight, in which there are 437½ grains to the ounce.

The Precious Metals, such as Silver and Gold, are sold by Troy Weight, containing 480 grains to the ounce.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre = 17 minims nearly.
3½ ,, ,, = 1 drachm.
28·4 ,, ,, = 1 ounce.
50 ,, ,, = 1 ounce, 6 drachms, 5 minims.
100 ,, ,, = 3 ounces, 4 drachms, 9 minims.
1000 ,, ,, or 1 litre, = to 61 cubic inches } = 35 ounces, 1 drachm, 36 minims.

The unit of French liquid measures is a cubic *centimètre.*

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme.* A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes. Drachms. Oz. Drachm. Grains.
100 ÷ 4 = 25 = 3 . 1 + 43

DEVELOPING FORMULÆ, ETC., OF THE PRINCIPAL PLATE-MAKERS.

In the following pages we have collated the developing formulæ of the principal makers of gelatine dry plates, lantern plates, and bromide paper. Commercial formulæ are now extremely numerous and varied. Their collection in this Almanac will enable many who have hitherto experienced difficulty in comparing the ingredients of a particular maker's formula with those of another to do so in future very readily.

AUSTIN EDWARDS'S FORMULÆ.

No. 1.	Pyrogallic acid	1 ounce.
	Nitric acid	20 drops.
	Water	80 ounces.
No. 2.	Sulphite of soda	10 ounces.
	Carbonate of soda (crystals)	9 ,,
	Water	80 ,,

Add the acid to the water before dissolving the pyro.

For correct exposure, use equal parts of Nos. 1 and 2.

For under-exposure, use more No. 2.

For over-exposure use more No. 1, or add a few drops of per ounce 10 per cent. bromide potassium solution.

For correct exposure, no bromide is necessary.

Alum Bath.

After developing, wash the plate well under the tap, and immerse for a few minutes in

Alum	3 ounces.
Water	20 ,,

Wash well again, and fix as usual.

Fixing Solution.

Hypo	1 pound.
Water	40 ounces.

Hydroquinone Developer for Negatives.

No. 1.	Water	20 ounces.
	Hydroquinone	120 grains.
	Sulphite soda	2 ounces.
No. 2.	Water	20 ounces.
	Carbonate of potash	4 ,,
	Bromide potassium	30 grains.

Dissolve the hydroquinone in the water before adding the sulphite. For use take equal parts of each.

Hydroquinone Developer for Lantern Plates.

(For Black Tones.)

Distilled water	20 ounces.
Hydroquinone	60 grains.
Sulphite soda	2 ounces.
Carbonate soda (crystals)	6 ,,
Bromide potassium	40 grains.

Dissolve the hydroquinone in the water and add the other ingredients in the order named.

Time of development, if exposed correctly, about 2 minutes. This developer may be used several times.

Pyro Developer.

(For Warm Tones.)

No. 1.	Water	20 ounces.
	Nitric acid	20 drops.
	Sulphite soda	4 ounces.
	Pyrogallic acid	1 ounce.
No. 2.	Water	20 ounces.
	Bromide ammonium (not potassium)	3 ,,
	Liq. ammonia ·880	1 ounce.

Add the acid to the water, and the other ingredients in the order named.

For use, take 1 part each of Nos. 1 and 2, and dilute with equal quantities of water. For still warmer tones, add 1 part more water, or again double the exposure and add one-fourth more No. 2. This developer may be used several times.

CADETT & NEALL'S FORMULÆ.

Stock Solution.

Pyrogallic acid	(avoirdupois)	1 ounce.
Ammonium bromide	,,	½ ,,
Potass. meta-bisulphite	,,	1 ,,

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Dissolve the meta-bisulphite and bromide in part of the distilled water before adding the pyrogallic acid.

A.	Stock Solution	1 ounce.
	Distilled water to make altogether	20 ounces = 1 pint.
B.	Ammonia (·890)	2½ drachms.
	Distilled water to make altogether	20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Fixing Solution.

Hypo	1 pound.
Water	1 quart.

Stock Solution.

Pyrogallic acid	(avoirdupois)	1 ounce.
Ammonium bromide	,,	1 ,,
Sulphurous or sulphuric or citric acid		1 drachm.

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Mix the acid with part of the distilled water before adding the bromide and pyrogallic acid.

A.	Stock solution	1 ounce.
	Distilled water to make altogether	20 ounces = 1 pint.
B.	Liq. ammonia (·890)	2½ drachms.
	Distilled water to make altogether	20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Fixing Solution.

Hypo	1 pound.
Water	1 quart.

Ferrous Oxalate Developer.

A.	Ferrous sulphate	(avoirdupois)	5 ounces.
	Sulphuric acid		10 minims.
	Distilled water to make altogether	(avoirdupois)	20 ounces.
B.	Neutral potass. oxalate	(avoirdupois)	10 ounces.
	Distilled water to make altogether	(fluid)	40 ,,

Dissolve the potass. oxalate in about three-quarters of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about three-quarters of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add one part of A to four of B. For over-exposure, add a few drops to the mixed developer of a ten per cent. solution of potassium bromide.

Fixing Solution.

Hypo	1 pound.
Water	1 quart.

We also give another formula for pyro-ammonia development without the meta-bisulphite of potass.

Pyro-Soda Developer.

Stock Solution.

Pyrogallic acid	(avoirdupois)	1 ounce.
Potassium metabisulphite		40 grains.
or sulphuric acid	(fluid)	1 drachm.
Distilled water to make altogether	,,	10 ounces.

A.	Stock solution	(fluid)	3 ounces.
	Distilled water to make altogether	,,	20 ,,
B.	Sodium carbonate (crystals)	(avoirdupois)	11 ounces.
	or ditto ditto (anhydrous)	,,	4 ,,
	Sodium sulphite (recrystd.)	,,	15 ,,
	Distilled water to make altogether	,,	80 ,,

Equal parts of each to make developer.

A few drops of a 10 per cent. solution of potassium bromide may be added to the developer when necessary. In very hot weather the hypo bath should not be stronger than 1lb. of sodium hyposulphite to 2 quarts of water.

DEVELOPERS FOR THE 'CADETT' LANTERN PLATES.

Warm Tones.—Pyro Ammonia.

A.	Pyrogallic acid	40	grains.
	Ammonium bromide	40	,,
	Potass metabisulphite	120	,,
	Distilled water to make altogether (fluid)	20	ounces.
B.	Liq. ammonia	150	minims.
	Distilled water to make altogether (fluid)	20	ounces.

Equal parts of A and B to make developer.

This formula gives rich warm tones with suitable exposure.

For warm black tones, the following may be used :—

A.	Pyrogallic acid	30	grains.
	Sodium sulphite	100	,,
	Sulphurous acid (or citric acid 5 grains)	5	minims.
	Ammonium bromide	30	grains.
	Distilled water to make altogether	20	ounces.
B.	Liq. ammonia ·890	40	minims.
	Distilled water to make altogether (fluid)	20	ounces.

Equal parts A and B to make developer.

A rich warm black can be obtained with hydroquinone, and we strongly recommend the following formula :—

A.	Hydroquinone	70	grains.
	Potass metabisulphite	10	,,
	or sulphurous acid	15	minims.
	Potassium bromide	35	grains.
	Distilled water to make altogether (fluid)	20	ounces.
B.	Potassium hydrate (sticks)	140	grains.
	Sodium sulphite	700	,,
	Distilled water to make altogether	20	ounces.

Equal parts A and B to make developer.

Black Tones.

Cold, but brilliant black tones are obtained with ferrous oxalate, adding a sufficient quantity of a 10 per cent. solution of potassium bromide to prevent too rapid development.

A.	Ferrous sulphate (avoirdupois)	5	ounces.
	Sulphuric acid	10	minims.
	Distilled water to make altogether (avoirdupois)	20	ounces.
B.	Neutral potass oxalate (avoirdupois)	10	ounces.
	Distilled water to make altogether (fluid)	40	,,

Dissolve the potass oxalate in about ¾ of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about ¾ of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add 1 part of A to 4 of B. For over-exposure add a few drops to the mixed developer of a 10 per cent. solution of potassium bromide.

Fixing Solution.

Hypo	1 pound.
Water	1 quart.

Tone or colour considerably depends on exposure, short exposures favouring colder tones; also, the more the developer is restrained with soluble bromides, the warmer the tones will be and *vice versâ.*

THE EASTMAN COMPANY'S FORMULÆ.

For Bromide Paper.

No. 1.	Oxalate of potash	16	ounces.
	Hot water	48	,,
No. 2.	Proto-sulphate of iron	16	ounces.
	Hot water	32	,,
	Acetic acid (or citric acid, ½ ounce)	½	drachm.
No. 3.	Bromide of potassium	1	drachm.
	Water	10	ounces.

These solutions must be cooled and kept separately, and should be mixed only for immediate use.

To develop, take in a suitable tray, No. 1, six ounces; No. 2, one ounce; No. 3, half drachm. Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer. The image should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer and flood the plate with the

Clearing Solution.

Acetic acid	1 drachm.
Water	32 ounces.

Do not wash the print after pouring off the developer and before applying the clearing solution. Use a sufficient quantity to flow over the print, say two ounces for an 8 × 10. Allow it to act for one minute, and then pour it off and apply a fresh portion; repeat the operation a third time, then rinse in pure water, and immerse for ten minutes in the

Fixing Bath.

Hyposulphite of soda	3	ounces.
Water	16	,,

After fixing, wash thoroughly two hours, and hang up to dry. Use fresh developer for each batch of prints. With a glass-bottomed tray, eight ounces of developer are sufficient for a 25 × 30 print.

For Kodak Films.

No. 1.	Sulphite of soda	6 ounces.
	Hot water	32 ,,
	When cold, add—	
	Pyrogallic acid	1 ounce.
No. 2.	Carbonate of soda	3 ounces.
	Carbonate of potash	1 ounce.
	Water	32 ounces.

To develop, take, for normal exposures, one part each of No. 1 and No. 2, together with two parts of water. Other developer formulæ may work with these films, but the above is recommended as reliable. A number of films can be developed in *one* dish at the same time, provided the developing fluid be sufficiently deep to submerge them.

Restrainer.

Bromide of potassium	1 ounce.
Water	6 ounces.

Restrainer is to be used only in case of over-exposure. As soon as developed, rinse slightly, and transfer to a saturated solution of common alum for two minutes; then rinse again, and fix.

Fixing Solution.

Hyposulphite of soda	4 ounces.
Water	16 ,,

If a number of films are fixed together in one tray, they should be put in *face down*, to avoid abrasion of the sensitive surface. It is well to move them about in the fixing bath, from time to time, in order to remove any air bubbles. After fixing, *wash thoroughly;* then immerse for one minute in the

Soaking Solution.

Water	16 ounces.
Glycerine	½ ounce.

Remove from the soaking solution, and pin up each film by *one* of its corners, to dry spontaneously. Any tear drops of the soaking solution should be removed with a bit of blotting-paper or absorbent cotton.

The object of the soaking solution is to prevent the film from curling when dry. The negative must not be rinsed after having been withdrawn from the soaking solution. In warm and moist climates the excessive use of glycerine is to be avoided, inasmuch as it tends to decompose the gelatine.

Always keep finished negatives flat—*do not roll them up.*

EDWARDS' FORMULÆ.

PYRO AND AMMONIA DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Citric acid	40 grains or 3 ,,
	Water	7½ ounces or 214 c.c.
2.	Strong ammonia ·880	1 ounce or 28 c.c.
	Bromide of potassium	120 grains or 8 grammes.
	Distilled water	7 ounces or 200 c.c.

The above will keep good for months, if well corked.

For use, dilute 1 part No. 1 with 19 parts of water, and in another bottle 1 part No. 2 with 19 parts of water. The dilute solutions should be made fresh every day.

To develop a correctly exposed plate or film mix equal parts of these two solutions.

In hot weather when making up the dilute solutions for use add 4 parts of No. 1 to 3 parts of No. 2, instead of equal parts of Nos. 1 and 2. In no case should the quantity of No. 2 exceed that of No. 1.

PYRO AND SODA DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Nitric acid	20 drops or 1 c.c.
	Water	80 ounces or 2 litres 300 c.c.
No. 2.	Sulphite of soda	10 ounces or 300 grammes.
	Carbonate of soda (washing soda)	8 ounces or 226 grammes.
	Water	80 ,, ,, 2 litres 300 c.c.
No. 3.	Bromide of potassium	1 ounce or 30 grammes.
	Water	9 ounces or 250 c.c.

To develop, mix equal parts of Nos. 1 and 2, and add 10 minims of No. 3 to each ounce of the mixed developer, or, instead, 3 ounces of No. 3 may be added to the 80 ounces of No 2. For rapid shutter exposures, omit the bromide.

This developer gives bold vigorous negatives of a neutral grey colour.

This developer, as also the following one, is given of full strength—it may often be used weaker with advantage by diluting with an equal bulk of water, especially when using isochromatic plates or films, which are otherwise liable to give too much density.

PYRO AND SODA DEVELOPER WITH METABISULPHITE.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Metabisulphite of soda (Boake's)	1 ,, ,, 30 ,,
	Water	80 ounces or 2 litres 300 c.c.

Dissolve the metabisulphite, and then add the pyro.

No. 2.	Carbonate of soda (washing soda)	12 ounces or 360 grammes.
	Sulphite of soda	4 ,, ,, 120 ,,
	Water	80 ,, ,, 2 litres 300 c.c.
No. 3.	Bromide of potassium	1 ounce or 30 grammes.
	Water	9 ounces or 250 c.c.

To develop, mix equal parts of Nos. 1 and 2. When working in the summer time in a good light, with full exposure, add 5 minims of No. 3 to each ounce of developer (or to save the trouble of measuring small quantities, 1½ ounces of No. 3 may be added to the 80 ounces of No. 2). In winter the bromide may generally be omitted, and also for rapid shutter exposures, and portrait work in the studio.

This developer gives exceedingly fine and delicate negatives, with full detail in the high lights, and of good colour for printing.

In either of the foregoing developers the No. 1 solution may be mixed as a stock solution, if preferred, by using only 8 ounces of water instead of 80, and diluting to above proportions as required.

The best and most efficient method of correcting over-exposures is that introduced by Mr. Edwards in 1888. This consists in using a separate strong but well-restrained developer as a redeveloper, which is substituted for the normal developer, as soon as over-exposure is recognised. When developing, this redeveloper is kept ready mixed in a measure, and if the detail of the negative rushes up too quickly, indicating over-exposure, the normal developer is poured off and the redeveloper instantly substituted for it without waiting to wash the plate; by this means very considerable over-exposure can be satisfactorily remedied, the redeveloper giving density without bringing out much more detail. This method of tentative development will be found exceedingly useful when developing a number of various or unknown exposures.

PYRO AND AMMONIA REDEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Citric acid	2 drachms or 8 grammes.
	Distilled water	32 ounces or 1000 c.c.
No. 2.	Ammonia ·880	2 ounces or 60 c.c.
	Bromide of ammonia	24 drachms or 96 grammes.
	Distilled water	32 ounces or 1000 c.c.

For use mix equal parts of Nos. 1 and 2.

PYRO AND SODA REDEVELOPER.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Metabisulphite of soda (Boake's)	1 ,, ,, 30 ,,
	Distilled water	28 ounces or 800 c.c.
No. 2.	Carbonate of soda (washing soda)	9 ounces or 250 grammes.
	Bromide of potassium	2 ,, ,, 60 ,,
	Distilled water	28 ,, ,, 800 c.c.

For use mix equal parts of Nos. 1 and 2.

HYDROQUINONE DEVELOPER.

No. 1.	Hydroquinone	¼ ounce or 7 grammes.
	Sulphite of soda	1 ,, ,, 30 ,,
	Bromide of potassium	7 grains or ½ gramme.
	Distilled boiling water to make	12 ounces or 340 c.c.
No. 2.	Carbonate of potash	½ ounce or 15 grammes.
	Distilled water to make	12 ounces or 340 c.c.

First dissolve the hydroquinone, and then add the sulphite and bromide.

For use mix equal parts of Nos. 1 and 2.

In case of slight over-exposure add a few drops or minims of a 10 per cent. solution of bromide of potassium to each ounce of developer, more or less according to the extent of over-exposure. For considerable over-exposure use the redeveloper.

For under-exposure, pour off the hydroquinone developer and finish development with the eikonogen developer given below.

Eikonogen Developer.

Eikonogen	½ ounce or 14 grammes.
Carbonate of potash	1 ,, ,, 30 ,,
Sulphite of soda	2 ounces or 60 ,,
Distilled boiling water	20 ,, ,, 600 c.c.

First dissolve the eikonogen, then the sulphite, and lastly the carbonate of potash.

This will be found a very useful developer for snapshot work and portraiture; for ordinary landscape work a mixture of this and the above given hydroquinone developer is to be preferred to eikonogen alone. One part of the eikonogen to two parts of the mixed hydroquinone developer will be found to work well, but the proportions may be varied to produce a developer possessing the required characteristics, eikonogen tending to softness and fulness of detail, and hydroquinone to bright shadows and full density.

Instead of mixing the developers, the development may be commenced with eikonogen, and when the detail is sufficiently out, hydroquinone substituted for it, without waiting to wash the negative, and the development finished with this, or in case of much over-exposure with the following hydroquinone redeveloper :—

Hydroquinone Redeveloper.

No. 1.	Hydroquinone	¼ ounce or 7 grammes.
	Sulphite of soda	2 ounces or 60 ,,
	Bromide of potassium	¼ ounce or 7 ,,
	Distilled boiling water to make	12 ounces or 340 c.c.
No. 2.	Carbonate of soda (washing soda)	2 ounces or 60 grammes.
	Sulphite of soda	2 ,, ,, 60 ,,
	Distilled water to make	12 ,, ,, 340 c.c.

For use mix equal parts of Nos. 1 and 2.

Fixing.

After development, well wash the negative under the tap, and immerse in the following :—

Fixing Bath.

Hyposulphite of soda	6 ounces or 180 grammes.
Water	1 pint or 600 c.c.

This is most conveniently used in a deep porcelain dish. The precaution should be taken when films are put into the fixing bath of keeping them well under, so that they are perfectly covered by the solution, otherwise stains may be caused.

The negatives should remain in the fixing bath for two or three minutes after they are apparently fixed so as to ensure perfect fixation.

If an acid fixing bath is preferred, add 1 ounce of metabisulphite of soda (Boake's) to the 6 ounces of hyposulphite of soda; the addition of the metabisulphite tends to keep the fixing bath clear and prevents discoloration of the negative.

Clearing.

When fixed, the negatives should be well rinsed under the tap, and if they have been developed with pyro, put into a dish containing the following clearing solution for about a minute. If developed with a developer other than pyro, the clearing bath is not necessary, and the negatives may be removed direct from the hypo to the washing tank.

Clearing Solution.

Alum	1 ounce or 30 grammes.
Citric acid	1 ,, ,, 30 ,,
(or sulphuric acid	¼ ,, ,, 7 ,,).
Sulphate of iron	3 ounces or 90 ,,
Water	20 ,, ,, 600 c.c.

EDWARDS'S GELATINO-CHLORIDE PLATES.

Development.

Make two stock solutions as follows:—

No. 1.	Neutral oxalate of potash	2 ounces.
	Chloride of ammonium	40 grains.
	Distilled water	20 ounces.
No. 2.	Sulphate of iron	4 drachms.
	Citric acid	2 ,,
	Alum	2 ,,
	Distilled water	20 ounces.

The above solutions will keep indefinitely.

When required for use, mix equal portions of the above solutions, adding No. 2 to No. 1, to form the developer, place the exposed plate film uppermost in a porcelain dish, and pour over rapidly and evenly the mixed developer, rock the dish during the progress of development (which may be examined from time to time by yellow or non-actinic light); when sufficient density is obtained, which will usually be in about 2 minutes, pour off the developer into a measure, and flood the plate with water and wash well under the tap.

The above developer, with moderate exposure, will give positives of a warm black colour; a still warmer tone may be easily obtained by simply diluting the mixed solutions with an equal quantity of distilled water, or by adding to each ounce two or three drops of a 20-grain solution of bromide of potassium, and proportionately increasing the time of exposure; short exposure and rapid development will give black tones, while full exposure and slow development will give warm brown or red tones to the transparency.

It will be found a good plan to make up two separate portions of developer, strong and weak, and commence with latter; should the plate prove to be under-exposed, the developer must be poured off, and the more concentrated solution used to bring out the picture and complete development. This method will allow considerable latitude in the time of exposure.

Several plates may be developed in the same solution, but the developer gradually loses its energy and will not keep long after being mixed.

Fixing.

Hyposulphite of soda	2 ounces.
Water	16 ,,

Pour sufficient of the above, when dissolved, into a porcelain dish, and immerse the developed and washed plate for two or three minutes, or until fixed, then rinse thoroughly under the tap and apply the following:—

Clearing Solution.

Sulphuric acid	1 ounce.
Saturated solution of alum	20 ounces.

Pour a small quantity of the above repeatedly over the plate for about half a minute, or until the slight deposit of oxalate of lime (caused by the washing water) is dissolved away, and the picture becomes bright and clear. The high lights of the transparency should be perfectly bare glass without a trace of deposit of any kind; as soon as cleared, wash well in repeated changes of water, and allow to dry spontaneously.

EDWARDS'S SPECIAL TRANSPARENCY PLATES.

Pyro and Ammonia Developer.

For Warm Tones.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Sulphite of soda	4 ounces or 120 ,,
	Citric acid	¼ ounce or 8 ,,
	Water to make	16 ounces or 460 c.c.

First dissolve the sulphite and citric acid, and then add the pyrogallic.

No. 2.	Bromide of ammonium	1 ounce or 30 grammes.
	Liq. ammonia ·880	5½ drachms or 20 c.c.
	Water to make	16 ounces or 460 c.c.

For use, mix 1 part of No. 1 and 3 parts of No. 2, and dilute with water to double the quantity. The mixed developer may be used over again for several plates. For lantern slides and transparencies from very thin negatives dilute the stock solution with less water.

For contact printing under the conditions given above, the exposure for negatives of medium printing densities will be from 20 to 60 seconds. If the correct time has been given the image should begin to appear in from 40 to 50 seconds, and the development be complete in about 5 minutes.

Hydroquinone Developer.

For Black Tones.

Hydroquinone	60 grains or	3 grammes.
Sulphite of soda	2 ounces or	45 ,,
Carbonate of soda (crystals)	4 ,, ,,	90 ,,
Carbonate of potash	2 ,, ,,	45 ,,
Bromide of potassium	40 grains or	2 ,,
Hot distilled water	20 ounces or	450 c.c.

For black and white line subjects add 1 drachm of a 60-grain solution of bromide of potassium to each ounce of developer.

Dissolve the hydroquinone in the water, and add the other ingredients in the order named.

This developer will keep good for at least a month; it can be used over again for several plates. Exposure for contact printing as above, 10 to 30 seconds. The image should begin to appear in about 40 seconds to a minute, and the development be completed in about 4 minutes.

Amidol Developer.

For Black Tones.

Amidol	80 grains or	5 grammes.
Soda sulphite	2 ounces or	60 ,,
Bromide of potassium	½ ounce or	15 ,,
Water	12 ounces or	360 c.c.

This developer is to be used without dilution, except when working from a very dense strong negative, when it can be diluted with an equal amount of water. It may be used repeatedly without apparent loss of developing power. With correct exposure it yields slides of a very fine black colour. Exposure for contact printing the same as for hydroquinone. Time of development, about 8 minutes.

These plates may be developed in either yellow or ruby light; the plate should be examined by looking through it from time to time, taking care not to expose it too much to the light. With pyro developer the transparency appears of nearly the same density before fixing as when finished, but when using hydroquinone or amidol the image must be developed to look much denser, as there is considerable reduction in the fixing bath.

As soon as the transparency is sufficiently dense in the shadows, place it direct in the fixing bath, without previous washing.

Fixing Bath.

Hyposulphite of soda	4 ounces or	120 grammes.
Water	20 ,, ,,	600 c.c.

Leave in this for at least 5 minutes, and then wash thoroughly for an hour or more.

To secure greater brilliancy and dissolve away any deposit caused by impurities in the washing waters, the transparency should be immersed for 2 or 3 minutes in some of the following clearing solution contained in a dish, using fresh for each plate. The transparency is afterwards to be well washed for 10 minutes:—

Alum	1 ounce or 30 grammes.
Citric acid	1 ,, ,, 30 ,,
Water	20 ounces or 600 c.c.

If, from an error in the exposure or want of quality in the original negative, the lantern slide or transparency is still wanting in sparkle, through the high lights being veiled, it may be effectually cleared, either at this stage or after being dried, by using Mr. Howard Farmer's reducer, made as follows:—

No. 1.	Ferridcyanide of potassium	60 grains or 4 grammes.
	Water	20 ounces or 600 c.c.
No. 2.	Hyposulphite of soda	1 ounce or 30 grammes.
	Water	20 ounces or 600 c.c.

For use, mix Nos. 1 and 2 in equal proportions. Place the transparency in a dish and flood it with the solution; the dish must be continually rocked and the transparency carefully watched, and removed instantly the highest lights are cleared, which will not usually take more than one or two minutes; it is then to be again well washed before being dried. This reducer is in practice very useful, but requires using with great care, as it is capable of dissolving away the whole of the image should the transparency be left in too long.

When thoroughly washed, the lantern slides or transparencies should be allowed to dry spontaneously, and are then ready for binding or mounting in the usual way. If desired, they may be previously varnished, using either our crystal varnish or protective varnish for films.

EDWARDS'S SENSITISED PAPERS.

Acetate Bath.

Chloride of gold	2 grains.
Acetate of soda	30 ,,
Bicarbonate of soda	4 ,,
Water	20 ounces.

Mix at least 12 hours before required for use. The most brilliant prints are produced when the bath is made fresh each day for the next day's work, but the same bath may be used for a long time by adding, after toning, sufficient gold, acetate and carbonate soda in the same proportions as at first, or 10 ounces of the used bath can be mixed with 10 ounces of water for making up the new bath, the gold, acetate and carbonate soda being added in the full proportions for 20 ounces. This method, on the whole, probably gives the most uniform results.

Borax Bath.

Chloride of gold	2 grains.
Borax	120 ,,
Water	20 ounces.

Work as above. If mixed with 10 ounces boiling and 10 ounces cold water, this bath can be used in 10 or 15 minutes.

Lime Bath (for Matt Surface Paper).

Chloride of gold	2 grains.
Chloride of lime solution	2 drops.
Chalk or whiting	1 teaspoonful.
Water	20 ounces.

To make the saturated solution of chloride of lime, pour a pint of boiling water on a tablespoonful of chloride of lime; after well stirring let it stand till cold, then filter into a bottle and keep well corked.

In making up a bath, add the lime solution and chalk to the water, and the gold last. Mix at least twelve hours before required for use; the clear solution is then to be poured off without disturbing the chalk sediment, and the bath is ready.

This bath keeps well; it should be renewed as required by the addition of the chloride of gold and lime solution in the above proportions, twelve hours or more before using, it being only necessary to add fresh chalk occasionally.

For toning with these baths the amount of gold required may be estimated, at most, at a grain of gold to a whole sheet of paper.

The temperature of the toning bath should not be below 60 deg. Fahr.

As each print is sufficiently toned it should be removed to a dish of clean water, then after washing in one change of water, remove them one by one to the fixing bath, in which it is better to place them face down.

Fixing Bath.

Hyposulphite of soda	2 ounces.
Water	15 ,,

It is important that this should be mixed the day before using, so as to ensure it being of a normal temperature. A freshly mixed bath will be many degrees too cold unless hot water be used for dissolving the crystals, which we do not recommend. Add before putting in the prints 10 drops of a 1 to 10 solution of ammonia; this amount should not be exceeded.

Move the prints about in the solution for 10 minutes, turning each one over singly and repeatedly separating them from each other, so as to allow of perfect fixation, then pour away the fixing bath and fill up the dish with a strong solution of common salt and water. Move the prints about in this for 5 or 10 minutes. The prints should not be placed direct from the strong salt solution into the washing water, but the dish slowly filled up from the tap so as to gradually reduce the density of the liquid then remove the prints to the washing tank to wash thoroughly.

ELLIOTT & SONS' FORMULÆ.

THE 'BARNET' PLATES, ORDINARY.

No. 1.	Ammonia (·880)	1½ ounce.
	Water	20 ounces.
No. 2.	Pyrogallic acid	160 grains.
	Bromide of ammonium	¾ ounce.
	Water	20 ounces.
	Pure nitric acid	10 drops.

For use, mix ½ an ounce of No. 1, ½ an ounce of No, 2 with 3 ounces of water.

Pyro and Ammonia (10 *per cent. Solutions*).

No. 1.	Ammonia (·880)	1 ounce.
	Water	9 ounces.
No. 2.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
No. 3.	Pyro	1 ounce.
	Water, to make	10 ounces.
	Nitric acid, pure	20 drops.

For studio use, take 80 minims No. 1, 40 minims No. 2, 20 minims No. 3, and make up to 2 ounces with water.

The above developer is the same strength as that recommended on the boxes.

For outdoor work, take 80 minims No. 1, 60 minims No. 2, 40 minims No. 3, and make up to 2 ounces with water.

Pyro and Soda Developer.

Solution No. 1.

Pyro	1 ounce.
Water	86 ounces.
Nitric acid, pure	20 drops.

Solution No. 2.

Pure sulphite soda	10 ounces.
Pure carbonate soda (crystals)	9 ,,
Water	86 ,,

Use equal parts of No. 1 and 2, and dilute with equal bulk of water. To each ounce add 1 or 2 drops of a 10 per cent. solution of bromide of potassium.

'BARNET' LANTERN TRANSPARENCY PLATES.

For Cold or Warm Tones (according to exposure and development).

INSTRUCTIONS FOR USE.

Contact Printing.—For black tones the exposure required is about 10 seconds at a distance of 1 foot from an ordinary gas flame: the developer to be used is either No. 1 or 2.

To secure warm tones it is necessary to increase the exposure to 2 or 3 minutes and use formula either No. 3 or 4.

To obtain still warmer (reddish) tones, increase the exposure still further to 5 or 6 minutes and develop with formula No 5.

Reductions in the Camera.—For black tones with stop *f*-16 in bright diffused light from a half-plate negative an exposure of about 10 seconds is required, using formula No 1 or 2 for developing.

For warm tones increase the exposure to 2 or 3 minutes and using for developer either formula No. 3 or 4.

For still warmer tones further increase the exposure to 5 or 6 minutes and develop with formula No. 5.

FORMULÆ FOR DEVELOPERS.

Note.—In cold weather all solutions should be raised to a temperature of 60°.

Cold Black Tones.

A.

No. 1.	Metol	400	grains.
	Soda sulphite	8	ounces.
	Water	80	,,

B.

Carbonate of potash	1200	grains.
Ammonium bromide	240	,,
Potassium bromide	480	,,
Water	80	ounces.

Take equal parts of A and B.

Note.—The ammonium bromide is necessary for the production of absolutely cold black tones; a larger quantity is not recommended, as it tends to produce a slight veil in the high lights.

Length of time in developing about 2 minutes.

Warm Black Tones.

A.

No. 2.	Hydroquinone	640	grains.
	Soda sulphite	8	ounces.
	Potass bromide	120	grains.
	Water	80	ounces.

B.

Sodium hydrate	640	grains.
Water	80	ounces.

Take equal parts of A and B.

This produces a very pleasing warm black. Length of time in developing about 2 minutes.

Warm Brown Tones.

A.

No. 3.	Pyro	1	ounce.
	Soda sulphite	4	ounces.
	Water	80	,,

B.

Carbonate of ammonia	900 grains.
Potassium hydrate	750 ,,
Ammonium bromide	600 ,,
Water	80 ounces.

Take equal parts of A and B.

Length of time in developing about 2 minutes.

Or the following may be used:—

No. 4.—Take equal parts of No. 2 formula and add to each ounce 3 grains carbonate of ammonia and 3 grains of ammonium bromide.

Length of time in developing about 3 or 4 minutes.

Very Warm (Reddish) Tones.

No. 5.—Take equal parts of No. 2 formula and add to each ounce 6 grains of carbonate of ammonia and 6 grains ammonium bromide.

Length of time in developing about 8 minutes.

Fixing Bath.

We recommend the bath not to be made stronger than

Hypo	5 ounces.
Water	20 ,,

Clearing solutions will not be found necessary with these plates.

BARNET BROMIDE PAPER.

(Extra Rapid)

Platino Matt Surface.—Directions for Working.

Exposure.—For contact work from an average negative about 4 seconds, 18 inches from an ordinary gas burner.

For enlarging it is impossible to give any fixed data, so much depending upon the source of light. It is recommended to make a trial exposure upon a small piece of paper.

After exposure place the print, sensitive side upwards, in a clean developing dish, flood with water for a few seconds, drain off water, and then with one sweep cause the developer to flow evenly and quickly over the whole surface of the print.

Developers.—Ferrous-Oxalate.

A.	Oxalate of potash	1 pound.
	Bromide potass	5 grains.
	Hot water	48 ounces.
B.	Sulphate of iron	1 pound.
	Citric acid	½ ounce.
	Hot water	32 ounces.

Take 6 ounces of A and 1 ounce of B.

Immediately after developing, the print must be transferred straight into the acid bath.

Acetic acid	1 drachm.
Water	32 ounces.

Allow to remain 1 minute and repeat the operation 3 times in all. Wash in 3 changes of water and immerse for 10 minutes in

Fixing Bath.

Hypo	4 ounces.
Water	20 ,,

We however strongly recommend the following

Metol Developer.

A.	Metol	400 grains.
	Sodium sulphite	8 ounces.
	Potass bromide	50 grains.
	Water	80 ounces.
B.	Potass carbonate	8 ounces.
	Water	80 ,,

Take 3 ounces of A and 1 ounce of B.

The image should appear in a few seconds, and development will be complete in about 2 minutes. Rinse in 3 changes of water and fix in fixing bath as above (no acid bath is necessary with this developer).

To produce softer results, either of the above may be diluted with an equal quantity of water.

After fixing, wash thoroughly in several changes of water for at least 2 hours, squeegee off the superfluous moisture, and hang up to dry.

THE ILFORD FORMULÆ.

STOCK SOLUTION OF PYRO.

Water	$5\frac{1}{2}$ ounces.
Nitric acid	20 minims.
Pyrogallic acid	1 ounce.

Add the acid to the water *before* the pyro, and the solution will then keep good for several months.

For Soft Negatives.

No. 1.	Stock solution	1 ounce.
	Water to make up to	20 ounces.

For Dense Negatives.

Stock solution	2 ounces.
Water to make up to	20 ,,

No. 2.	Carbonate of soda, crystals (not bicarbonate) (avoirdupois)	2 ounces.
	Sulphite of soda ,,	2 ,,
	Bromide of potassium	20 grains.
	Water to make up to	20 ounces.

For normal exposures take equal quantities of Nos. 1 and 2.

Pour the developer carefully over the plate, avoiding air bubbles, rock the dish, carefully keeping the plate well covered with solution; to obtain proper density allow the plate to remain after all detail is out. Judge of this by looking through the plate.

To compensate for errors of exposure, the proportions of Nos. 1 and 2 can be varied thus: for *under*-exposure use more of No. 2 than of No. 1, and for *over*-exposure, more of No. 1 than of No. 2. It is a good plan when there is a doubt as to the exposure being correct, to commence the development with twice the quantity of No. 1 than of No. 2, and add more of No. 2 if found desirable. To compensate for *under*-exposure the mixed developer can also be diluted with water, of course allowing a longer time for its action.

Alum Bath.—After developing, wash the plate well under the tap, and mmerse for a few minutes in

Alum	3 ounces.
Water	20 ,,

Fixing.—Wash well again, and fix as usual.

Hyposulphite of soda	1 pound.
Water	40 ounces.

Allow to remain in this bath for several minutes after fixation is apparently completed.

Never omit the alum bath, and do not be tempted to add any other chemical either to that or to the fixing bath.

ILFORD BROMIDE PAPER AND OPALS.

Directions for Using Ilford Bromide Paper and Opals.

The paper is made in four grades. S.S., smooth slow; S.R., smooth rapid; R.S., rough slow; R.R., rough rapid.

The slow kind is suitable for both contact printing by artificial light and for enlargement for daylight. The rapid for enlargement by artificial light. The question of the surface is one of taste only, though the rough is preferable for large work.

Exposure.—For contact work on slow paper, place paper in printing frame under negative in dark room. Expose for about 20 seconds at 12 inches from an ordinary fish-tail gas burner, with a negative of average density. Rapid bromide is 20 times as sensitive. To obtain uniform results, exposures must be made under uniform conditions as to light and distance.

Development.—Make the following solutions and use when cold:—

No. 1.	Neutral oxalate potash (avoirdupois)	1 pound.
	Warm water	64 ounces.
	Bromide ammonium	20 grains.

Filter.

No. 2.	Sulphate iron (avoirdupois)	1 pound.
	Warm water	48 ounces.
	Sulphuric acid	1 drachm.

Filter.

For use, add 1 ounce No. 2 to 6 ounces No. 1, not *vice versâ*. As for Alpha, old developer gives brilliancy, especially in cases of over-exposure or weak negatives. Development is complete when image appears fully out. After development and without washing, immerse the prints for about 2 minutes in clearing solution, pour off and repeat.

Clearing Solution.

Water	80 ounces.
Sulphuric acid	½ ounce.

Then wash thoroughly for about 10 minutes in several changes of water. All the acid must be removed, or fading of prints will result.

Fixing.

Water	80 ounces.
Hyposulphite of soda ....(avoirdupois)	1 pound.

Allow 15 minutes for thorough fixation. Use fresh solution for each batch of prints.

After fixing, wash for 2 hours in running water or in frequent changes. Allow prints to dry naturally. Work with clean hands and clean dishes.

ILFORD PRINTING-OUT PAPER.

Working Instructions.

Printing.—This should be done in shade by preference, unless negatives are specially strong in contrast. The image loses very little depth in toning, &c.

First washing.—For 15 minutes in several changes.

Toning.—For simplicity and excellence of results we recommend the following :—

Water	16 ounces.
Sulphocyanide of ammonium	30 grains.
Chloride of gold	2 ,,

The prints tone in this bath in about 6 minutes, and it should be borne in mind that prints dry somewhat darker and much colder than they appear when wet. The bath should not be used many times; indeed, it is well to make a stock sulphocyanide solution in bulk, and take as much of it as is needed, adding the gold as wanted. A bath with double quantity of water tends to warm tones.

Second washing.—For 5 minutes in several changes.

Fixing.—Use new solution for each batch of prints. The following is best strength :—

Hypo	3 ounces.
Water	20 ,,

Fixation is complete in about 10 minutes.

Final washing.—For at least 2 hours in running water, or many changes.

Drying.—Lay the prints face upwards on the blotting paper (or hang up by clips), and allow to dry naturally. Mount with starch paste in usual way.

Alum bath.—If weather is hot, and the surface of the prints becomes soft, immerse for 10 minutes in alum bath (water, 20 ounces; alum, 2 ounces), after the first washing, and before toning, then wash for 10 minutes before putting into toning bath.

Special notes.—Do not use any excess of sulphocyanide over quantity mentioned.

Use the washing water and all solutions as cold as possible.

Keep the prints moving whilst in the various solutions.

Above remarks apply to both varieties of P.O.P., matt and glossy.

A UNIVERSAL DEVELOPER.

No. 1.	Hydroquinone		160 grains.
	Bromide of potassium		30 ,,
	Sulphite of soda	(avoirdupois)	2 ounces.
	Water to		20 ,,
No. 2.	Soda hydrate		100 grains.
	Water		20 ounces.

Use as follows:—For negatives on Ilford plates: Equal parts Nos. 1 and 2.

For Ilford alpha lantern plates (for warm tone): One part No. 1; half part No. 2; two parts water.

For Ilford bromide papers: One part No. 1 one part No. 2; one part water.

For Ilford special lantern plates (for black tones): Equal parts Nos. 1 and 2.

Although it must be understood that, in our opinion, hydroquinone is somewhat inferior to ferrous oxalate for papers, yet we do not hesitate to put forward this universal developer as an alternative method of working for those who desire simplicity.

NOTE.—The clearing bath must not be used when developing with hydroquinone.

FOR ALPHA PAPER,

For producing Warm Toned Prints by Development.

Make the following solutions, and do not use until cold:—

No. 1.	Oxalate of potash (neutral)	(avoirdupois)	1 pound.
	Bromide of ammonium		320 grains.
	Warm water		64 ounces.

Filter.

No. 2.	Sulphate of iron	(avoirdupois)	4½ ounces.
	Citric acid	,,	½ ounce.
	Water	,,	80 ounces.

Filter.

For use, add one part of No. 2 to three parts of No. 1, not *vice versâ.* t will be noted that the developer is weak and much restrained; a more vigorous formula is unsuitable. The prints can be soaked in water if desired, but it is not essential, the only object being to secure an even flow of developer over surface. Development is complete when image appears fully out. At this stage a correctly exposed print will be of a warm brown colour, with a peach bloom over the whole surface. Over-exposures are indicated by a yellowish red colour, and under-exposures by greenish black.

Old developer, freshened with a proportion of new just before use, gives the best results. This is best kept in a bottle filled up to the stopper, replenished from time to time as required, with the two solutions freshly mixed. After development, and without washing, immerse for about half a minute in clearing solution, pour off, and repeat.

Clearing Solution.

Water	80 ounces.
Sulphuric acid	½ ounce.

This has a reducing action on alpha prints; therefore do not allow them to stay in the bath longer than time given, unless it is desired to correct over-development. Wash thoroughly for eight to ten minutes in several changes of water; all the acid must be removed, or yellowness of whites will result. Prints are now ready for toning and fixing, which can be done by gas or subdued daylight.

Combined Toning and Fixing Bath.

Water	(avoirdupois)	10 ounces.
Hyposulphite of soda	,,	2½ ,,
Acetate of soda	,,	½ ounce.
Sulphocyanide of ammonium	,,	¼ ,,
Chloride of gold	,,	4 grains.

This bath should be made forty-eight hours before use and allowed to clear; it keeps good for months in the dark, and may be used over and over again if replenished from time to time with a few drachms of a stock solution, made up as above with five of water only, and double quantity of gold. The constituents of the bath must be added and dissolved in the order given.

When first put into the combined bath, the prints turn yellow and lose all their vigour, but gradually regain both colour and strength, and toning is complete in about a quarter of an hour. Prints dry darker in tone, more vigorous in image, and with more detail than they appear when wet. After toning wash for two hours in running water, or in frequent changes. Allow the prints to dry naturally, or they can be squeegeed down whilst wet, on talced glass, matt or polished, or clean ferrotype plates, to produce matt or enamelled surface, as may be desired.

THE IMPERIAL COMPANY'S FORMULÆ.

DEVELOPER FOR IMPERIAL PLATES.

Pyro and Soda.

No. 1.

Pyrogallic acid	1 ounce.
Potassium bromide	50 grains.
Sulphite soda	5 ounces.
Sulphuric acid (10 per cent. solution)	½ ounce.
Water to	50 ounces.

No. 2.

Carbonate soda (washing soda)	5 ounces.
Water to	50 ,,

For use, take equal quantities of No. 1 and No. 2.
For under-exposure, use more of No. 2.
For over-exposure, use more of No. 1.

This developer gives the finest results with these plates.

Alum Bath.

Alum	1 ounce.
Water	10 ounces.

Wash before and after immersing in alum bath.

Fixing Solution.

Hypo	1 pound.
Water	50 ounces.

The following formulæ may also be used:—

Pyro and Ammonia.

Stock Solution.

Pyrogallic acid	(avoirdupois)	1 ounce.
Ammonium bromide		1 ,,
Sulphuric acid (10 per cent. solution)		½ ounce.
Water to make	(fluid)	10 ounces.

No. 1.

Stock solution	1½ ounce.
Water	18½ ounces.

No. 2.

Liquor ammoniæ, ·890	2½ drachms.
Water	20 ounces.

For use, take equal quantities of No. 1 and No. 2.
For over-exposure, use more of No. 1.
For under-exposure, use more of No. 2.

Hydroquinone Developer.

No. 1.

Hydroquinone	150 grains.
Potassium bromide	25 ,,
Soda sulphite (avoirdupois)	2 ounces.
Water (fluid)	20 ,,

No. 2.

Caustic soda	100 grains.
Water	20 ounces.

For development, use equal portions of each.

Eikonogen Developer.

No. 1.	Eikonogen	½ ounce.
	Soda sulphite	1 ,,
	Water	20 ounces.
No. 2.	Caustic potash	½ ounce.
	Water	20 ounces.

For use take equal parts of No. 1 and No. 2.

For over-exposure, use more of No. 1. For under-exposure, use more of No. 2.

Eikonogen Developer.

In one Solution.

Eikonogen	½ ounce.
Caustic potash	½ ,,
Soda sulphite	1 ,,
Water	20 ounces.

Dilute with a similar volume of water. If the picture develops too rapidly, add more water.

Metol.

No. 1.	Metol	50 grains.
	Dissolve in water	10 ounces.
	Then add soda sulphite	1 ounce.
No. 2.	Soda carbonate (washing soda)	2 ounces.
	Water to	10 ,,
No. 3.	Pot. bromide	½ ounce.
	Water to	10 ounces.

The developer for normal exposures to consist of 3 parts of No. 1 to 1 part of No. 2, to each ounce of which may, as a rule, be added 20 minims of No. 3. For instantaneous exposures omit No. 3; for doubtful or tentative development use 10 minims of No. 3 to each ounce of developer.

Amidol.

Amidol	¼ ounce.
Soda sulphite	2½ ounces.
Water	12 ,,

This should be diluted with 3 to 10 times its volume of water before using.

N.B.—The mixed developer will not keep.

Clearing Bath.

Alum	1 ounce.
Water	10 ounces.

Wash before and after immersing in alum bath.

Fixing Solutions.

For Glass Negatives and Films.

Hypo	1 pound.
Water	50 ounces.

IMPERIAL FILMS.

These films are coated with emulsion (of the same rapidity and quality as used for Imperial plates) on thick transparent celluloid, consequently requiring the same exposure. They can be used in ordinary dark slides by supporting the film with a thin piece of card, but preferably by using a film carrier.

For development, any of the Imperial plate developing formulæ may be used, but it is not advisable to develop more than one film in a dish, so preventing all risk of scratching the moistened emulsion surface.

IMPERIAL 'SPECIAL' LANTERN PLATES.

For producing Transparencies of a Black Tone.

The exposure required for a negative of ordinary density will be about 5 seconds, at a distance of 24 inches from a medium sized gas burner.

Developing formula (hydroquinone) is the same as that used with our ordinary plates.

For development, use 1 part of No. 1 to 1 part of No. 2, and 1 part of water.

Metol developer is also excellent.

After development, the manipulations, washing, &c., will be the same as for negatives.

IMPERIAL 'SLOW' LANTERN PLATES.

For producing Transparencies of a Warm Tone.

The exposure required for a negative of ordinary density will be about 15 seconds, at a distance of 12 inches from a medium size gas burner.

Developing formula (hydroquinone) is the same as that used with 'special' lantern plates.

IMPERIAL BROMIDE OPALS. BROMIDE AND KLITO PAPERS.

DEVELOPERS.

Metol. A.

No. 1.	Metol	50 grains.
	Dissolve in water	10 ounces.
	Then add soda sulphite	1 ounce.
No. 2	Soda carbonate (washing soda)	2 ounces.
	Water to	10

No. 3.	Potassium bromide	½ ounce.
	Water to	10 ounces.

The developer for normal exposures to consist of 3 parts of No. 1 to 1 part of No. 2, to each ounce of which may, as a rule, be added 20 minims of No. 3.

Oxalate and Iron. B.

No. 1.	Potash oxalate	4 ounces.
	Water	16 ,,
No. 2.	Iron sulphate	3 ounces.
	Water	12 ,,
	Citric acid	50 grains.

Add 1 ounce of No. 2 to 5 ounces of No. 1; and to every ounce of developer add about 10 drops of a 10 per cent. solution of potassium bromide.

No. 2 solution must always be added to No. 1 and not *vice versâ.*

Clearing Bath. C.

Alum	2 ounces.
Water	40 ,,
Citric acid	½ ounce.

Or instead of citric acid use ¼ ounce of sulphuric acid.

Do not wash before immersing in clearing bath.

Fixing Solution. D.

Hypo	4 ounces.
Water	20 ,,

Alum Bath. E.

Alum	½ ounce.
Water	20 ounces.

Leave for 10 minutes and wash in running water for 5 minutes.

Preference is given to 'Metol' as a developer, as it will be found in practice to be more rapid, cleaner, and simpler to work, than oxalate and iron. The mixed solution will develop several prints before requiring strengthening.

No clearing solution is required, but the prints must be well washed before immersing in fixing solution (D).

With oxalate and iron (B) immerse the prints in clearing solution (C), when development is complete, for a few minutes before washing.

After rinsing 10 minutes in a few changes of water fix in :—Fixing solution (D), and wash well.

Take care to have everything perfectly clean. The slightest trace of impurity conveyed to the solutions by dirty hands or dishes will spoil all results.

Developing solutions must be fresh and cold, and the clearing solution used immediately after development before washing.

Exposure.

The exposure required with bromide opals, bromide and Klito papers, with oxalate developer (B), for contact printing with a negative of ordinary density, will be about 10 seconds, at a distance of 12 inches from a medium size gas burner; for developer (A), about 5 seconds, or less.

Enlargments by artificial light or daylight should be tested to ensure accuracy, by exposing a strip of the paper.

Finishing Klito Paper.

If a gloss surface is required, dry on glass previously prepared with French chalk.

If a matt surface is required, dry on fine ground glass previously prepared with French chalk.

Otherwise, dry face upwards on blotting paper, and mount with starch paste. If to be burnished, the alum bath (E) must be used, and the burnisher is not to be heated to more than 160 degrees.

Enamelled prints should be backed with waterproof paper before being detached from the glass plate.

MARION'S FORMULÆ.

For portraiture the following is recommended :—

PYRO STOCK SOLUTION.

Pyrogallic acid	1 ounce.
Sodium sulphite	4 ounces.
Sulphuric acid	1 drachm.
Water to make up	20 ounces.

SODA STOCK SOLUTION.

Sodium carbonate cryst.	8 ounces.
Sodium sulphite	4 ounces.
Potassium bromide	1 drachm.
Water to make up	20 ounces.

For Development.

Five ounces of each stock solution made up separately to 20 ounces with water and mixed in equal parts at the time of using. When very soft negatives are required—or only a minimum of exposure can be given —the bromide of potassium may be omitted.

PYRO.

Pyrogallic acid	1 ounce.
Ammonium bromide	1 ,,
Citric acid	1 drachm.
Water to make up	10 ounces.

AMMONIA.

Strongest liquid ammonia ·880	2	ounces.
Water to make up	10	,,

Two ounces of each of above separately made with water to 20 ounces, form the solutions for use. Equal parts being mixed together at the time of development.

HYDROQUINONE DEVELOPER.

Hydroquinone Solution.

Hydroquinone	40	grains.
Sodium sulphite, pure	120	,,
Potassium brom.	5	,,
Citric acid	5	,,

Water to make up to 10 ounces.

Alkali Solution.

Potass. hydrate, pure	80 grains.

Water to make up to 10 ounces.

This developer, mixed in equal proportions, will contain per ounce—Hydroquinone, 2 grains; sulphite, 6 grains; brom., ¼ grain; citric, ¼ grain; hydrate, 4 grains.

In cold weather the developer should be kept up to a temperature of not less than 68° Fahr.

In warm weather and hot climates do not omit alum bath both before and after fixing.

Another good formula is—

Hydroquinone	40	grains.
Sodium sulphite, pure	240	,,

Water to make up to 10 ounces.

Sodium carbonate, pure	320 grains.

Water to make up to 10 ounces.

This developer, mixed in equal proportions, will contain per ounce—Hydroquinone, 2 grains; sodium sulphite, 12 grains; sodium carbonate, 16 grains.

Equal parts of the hydroquinone and either alkali solution to be mixed at time of using.

Potass. carbonate may be substituted for the soda in the first formula, or they may be mixed in varying proportion.

In the second formula sodium hydrate may be substituted for the potassium, and the proportions of bromide increased or decreased according to the kind of negative required, more for bright, and less for soft negatives.

EIKONOGEN FORMULÆ.

No. 1.—For Portraits and Landscapes.

No. 1. 4 parts sulphite of sodium are dissolved in 60 parts of water. To this solution add 1 part of eikonogen, and dissolve by shaking.

The solution can also be prepared in the following manner:—

To 4 parts of sulphite of sodium and 1 part eikonogen, which are placed either in an earthen or enamelled vessel, 10 parts water are added, and the dissolution brought about by boiling and stirring. The hot solution is then poured into a flask containing 50 parts cold water.

No. 2. 3 parts crystallised carbonate of soda are dissolved in 20 parts cold water.

Immediately before developing, mix 3 parts of solution No. 1 with part of solution No. 2.

No. 2.—For Instantaneous Photographs with Detective Cameras (about $\frac{1}{50}$ of a second exposure).

For this purpose Formula No. 1 is to be used, with the exception that the crystallised carbonate of soda is to be substituted by the same quantity of carbonate of potassium.

No. 3.—For very Short Instantaneous Exposures ($\frac{1}{1000}$ of a second), and for Increasing the Power of the Developers Nos. 1 and 2 in Cases where the Plate has not been sufficiently Exposed.

5 parts sulphite of sodium, 2 parts carbonate of potassium, and 1 part of eikonogen are placed in an earthen or enamelled vessel, and to these are added 30 parts water, the dissolution being brought about by boiling and stirring.

After having been allowed to cool, the developer, which is now ready for use, is preserved in a tightly closed bottle.

The developer, if it has been prepared exactly according to the above method, keeps in good condition for a long time.

FOR GELATINO-CHLORIDE PLATES.

IRON.

For Cold Tones.

No. 1.	Potass. citrate	100 grains.
	Potass. oxalate	30 ,,

Hot distilled water to make up to 1 ounce.

For Warm Tones.

No. 2.	Citric acid	90 grains.
	Ammonium carbonate	60 ,,

Cold distilled water to make up to 1 ounce.

For Extra Warm Tones.

No. 3.	Citric acid	130 grains.
	Ammonium carbonate	40 ,,

Cold distilled water to make up to 1 ounce.

In mixing the solutions Nos. 2 and 3, it is better to place the crystals of the salts into a deep vessel, and, after adding the water, leave alone till all effervescence ceases. It is advisable to make it over night.

To three parts of either of the above add one part of the following at the time of using :—

Sulphate of iron	120 grains.
Sulphuric acid	1 drop.

Make up with distilled water to 1 ounce.

Either of these developers should give clear glass in the unexposed parts of the picture; but, if at any time the slightest fog is found, it should at once be cured by the addition of a trace of either potassium bromide or sodium chloride. Bromide is better with No. 1, and chloride with either No. 2 or No. 3. A convenient form of using these will be to keep a ten per cent. solution of each of these salts, and one or two minims to each ounce of developer will be found a powerful restrainer.

HYDROQUINONE.

No. 1.	Hydroquinone	48 grains.
	Sodium sulphite	320 ,,
	Ammonium bromide	2 ,,

Water to make up to 10 ounces.

No. 2.	Ammonium carbonate	100 grains.
	Sodium carbonate	100 ,,

Water to make up to 10 ounces.

Equal proportions of each are mixed together, according to size of plate to be developed at the time of using.

Different alkalies may be substituted for those mentioned, such as potassium carbonate, sodium silicate, potassium hydrate, sodium hydrate, &c.; but, in all cases, a small proportion of bromide should be used.

A number of plates may be developed one after the other in the same solution.

FOR BROMIDE PAPER.

1.	Distilled water	20 ounces.
	Oxalate potash (neutral)	6 ,,
2.	Distilled water	5 ounces.
	Protosulphate iron	1¼ ,,
	Sulphuric acid	2 drops.
3.	Distilled water	5 ounces.
	Citric acid	2½ ,,

Each of the above solutions should be filtered. At time of development take twenty parts of No. 1, and into it pour five parts of No. 2, and two parts of No. 3. Lay the exposed paper face upwards, in a flat tray, and pour the developer over it, rocking the tray backwards and forwards, until the print is sufficiently developed. Then wash quickly in several changes of water, and place in fixing baths composed as follows :—

Fixing Baths.

Bath No. 1.

1. Water	10 ounces
Hypo soda	2 ,,
2. Water	3 ,,
Powdered alum	250 grains.

Bath No. 2.

Water	10 ounces.
Hypo soda	2 ,,

The prints are first placed in fixing bath No. 1, until they lose the yellow colour, and then passed into fixing bath No. 2, where they should remain at least ten minutes.

MAWSON & SWAN'S FORMULÆ.

THE 'MAWSON' OR 'CASTLE' PLATE.

DEVELOPERS.

Pyro-Ammonia Developer.

Stock Solution (10 per cent.).

Pyrogallic acid	480 grains.
Bromide of ammonium	240 ,,
*Metabisulphite of potassium	480 ,,
Distilled water to make up (fluid)	10 ounces.

Dissolve the metabisulphite in part of the water, then add the other ingredients, and make up to bulk with water.

A. Stock solution	300 minims.
Distilled water to make up to (fluid)	10 ounces.
B. Liq. ammonia ·880	70 minims.
Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Pyro-Soda Developer.

Pyrogallic acid	60 grains.
*Metabisulphite of potassium	15 ,,
Distilled water to make up to (fluid)	10 ounces.
B. Washing soda	600 grains.
Sulphite of soda	800 ,,
Distilled water to make up to (fluid)	10 ounces

Use equal parts of A and B mixed at time of developing.

To correct errors in exposure :—If under-exposed, use a larger proportion of B ; if over-exposed, decrease the proportion of B, and add a few drops of a 10 per cent. solution of bromide of potassium.

* Metabisulphite of potassium is unequalled as a preservative of pyrogallic acid in solution. If not at hand, substitute for each grain of metabisulphite, sulphuric acid $\frac{1}{2}$ minim *plus* sulphite of soda, $2\frac{1}{2}$ grains.

Eikonogen Developer.

A.	Eikonogen	100 grains.
	Sulphite of soda (recrystd.)	100 ,,
	Distilled water to make up to	(fluid) 10 ounces.
B.	Carbonate of potassium (com.)	1200 grains.
	Sulphite of soda (recrystd.)	500 ,,
	Distilled water to make up to	(fluid) 10 ounces.

Use 3 parts of A to 1 part of B, mixed at time of developing.

Hydroquinone Developer.

A.	Hydroquinone	40 grains.
	Metabisulphite of potassium	40 ,,
	Bromide of potassium	5 ,,
	Distilled water to make up to	(fluid) 10 ounces.
B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to	(fluid) 10 ounces.

Use equal parts of A and B mixed at time of developing.

Fixing Solution.

Hyposulphite of soda	1000 grains.
Water to make up to	(fluid) 10 ounces.

THE 'MAWSON' PHOTO-MECHANICAL PLATE.

DEVELOPERS.

Pyro-Ammonia Developer.

A.	Pyrogallic acid	30 grains.
	Bromide of ammonium	30 ,,
	Metabisulphite of potassium	30 ,,
	Distilled water to make up to	(fluid) 10 ounces.
B.	Liq. ammonia ·880	70 minims.
	Distilled water to make up to	(fluid) 10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A	Hydroquinone	40 grains.
	Bromide of potassium	10 ,,
	Metabisulphite of potassium	40 ,,
	Distilled water to make up to	(fluid) 10 ounces.

B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Fixing Solution.

Hyposulphite of soda	1000 grains.
Water to make up to (fluid)	10 ounces.

THE 'MAWSON LANTERN' PLATE.

Developers.

Exposure.—A negative of average density requires about 15 seconds 1 foot from a No. 6 batswing burner. Short exposure tends to produce black tones; long exposure, brown tones.

Either of the following developers may be used, though we give the preference to the pyro-ammonia, greater variety of tone being available by it.

Development begins rather slowly, especially with the hydroquinone formula, afterwards proceeding more rapidly.

Pyro-Ammonia Developer.

A.	Pyrogallic acid	20 grains.
	Bromide of ammonia	20 ,,
	Metabisulphite of potassium	50 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Liq. ammonia ·880	70 minims.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A.	Hydroquinone	40 grains.
	Bromide of potassium	40 ,,
	Metabisulphite of potassium	40 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Eikonogen Developer.

A.	Eikonogen	100 grains.
	Bromide of potassium	20 ,,
	Sulphite of sodium (recrystd.)	100 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Washing soda	600 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Ferrous Oxalate Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid	15 ,,
	Distilled water to make up to (fluid)	10 ounces.

*B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at time of developing.

* Should this solution after keeping change to a brown colour, discard and mix afresh.

Fixing Solution.

Hyposulphite of soda	1000 grains.
Water to make up to (fluid)	10 ounces.

The plates must be thoroughly washed, after fixing, and finally to remove any sediment that may have adhered to the film whilst washing, hold each plate under the tap, and go carefully over the surface with a tuft of cotton-wool, or a camel-hair mop brush. Take great care to prevent dust settling on plates while drying.

THE MAWSON OPAL PLATE.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid	15 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing.

Should B, after keeping, change to a brown colour, discard and mix afresh.

Clearing Solution.

Acetic acid	30 minims.
Water to make up to (fluid)	10 ounces.

Fixing Solution.

Hyposulphite of soda	1000 grains.
Water to make up to (fluid)	10 ounces.

Do not wet the plate before pouring on the developer. When sufficiently developed, pour off developer, and without washing, flood the plate with clearing solution, allowing it to act for 2 minutes; the plate must then be washed and immersed in the fixing solution for 15 minutes, and afterwards thoroughly washed, both under the tap and by soaking in changes of water. Finally, to remove any sediment that may have adhered to the film whilst washing, hold the plate under the tap, and go carefully over the surface with a tuft of cotton-wool, or camel-hair mop brush. Take great care to prevent dust settling on the plate while drying.

THE MAWSON BROMIDE PAPER.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid	15 ,,
	Distilled water to make up to (fluid)	10 ounces.

B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing.

Should B, after keeping, change to a brown colour, discard and mix afresh.

Clearing Solution.

Acetic acid	30 minims.
Water to make up to (fluid)	10 ounces.

Fixing Solution.

Hyposulphite of soda	1000 grains.
Water to make up to (fluid)	10 ounces.

Development.—Soak the exposed paper in clean water until quite limp, then transfer to the developing solution. Directly after immersion, go over the surface of the paper with a broad camel-hair brush to break any air-bells that may have formed, and be sure that it is kept quite covered with the solution, and moved about to ensure equal development. When sufficiently developed, transfer the prints to the clearing solution without washing. Keep the prints moving, and allow them to remain in this solution for 2 minutes, and if many prints are being developed, change the solution frequently. After washing, the prints are immersed in the fixing solution, where they should remain for 15 minutes, and be kept moving. They are then to be transferred to a strong solution of common salt for about 5 minutes, and afterwards thoroughly washed in repeated changes of water. Blot off and lay out singly face up, or hang up by the corner to dry, and mount in the ordinary way.

THE PAGET PRIZE PLATE COMPANY'S FORMULÆ.

PYRO AMMONIA.

No. 1.	Pyrogallic acid	1 ounce.
	Citric acid	60 grains.
	Sodium sulphite (pure)	2½ ounces.
	Distilled water to make	20 ,,
No. 2.	Liq. ammoniæ ·880	1 ounce.
	Ammonium bromide	80 grains.
	(For Phœnix plates, 120 grains.)	
	Distilled water to make	20 ounces.

One part of each to 10 parts of water.

PYRO SODA.

No. 1.	Pyrogallic acid	¼ ounce.
	Sulphuric acid	5 drops.
	Distilled water to make	20 ounces.

No. 2.	Carbonate of soda (cryst. pure)	2 ounces.
	Sulphite of soda (pure)	2 ,,
	Distilled water to make	20 ,,

Equal parts of each.

HYDROQUINONE.

No. 1.	Hydroquinone	1 ounce.
	Methylated spirit	10 ounces.
	Sulphurous acid	½ ounce.
	Potassium bromide	¼ ,,

Dissolve the hydroquinone in the spirit, and add the acid. In another vessel dissolve the potassium bromide in 3 ounces of distilled water. Mix the two solutions, and make up to 20 ounces with distilled water.

No 2.	Caustic soda (in sticks)	1 ounce.
	Sodium sulphite	5 ounces.
	Distilled water to make	20 ,,

One part of each to 4 parts of water.

If this be found to give too hard a negative, use more water.

EIKONOGEN.

No. 1.	Eikonogen	½ ounce.
	Sodium sulphite	1½ ,,
	Potassium bromide	8 grains.
	Distilled water to make	30 ounces.

Sixty grains hydroquinone added to above is a decided improvement, increasing brilliancy and density.

No. 2.	Potassium carbonate	1 ounce.
	Distilled water to make	10 ounces.

Three parts of No. 1 to one part of No. 2.

PAGET PRIZE LANTERN PLATES.

The plates are made in two rapidities:—

Slow, for contact printing by artificial light, or for reduction in camera by daylight. They give a range of tone from black to red, according to exposure and development.

Rapid, which are about six times quicker than the slow, are for reduction in camera by artificial light, or may be used for contact printing with very dense negatives or very short exposures. These give only black tones.

INSTRUCTIONS FOR USE.

Rapid Series.

Exposure.—These plates, which give only black tones, require about one-sixth of the exposure of the slow series as below.

Development.—Any of the formulæ given for the slow series *for black tones* are equally suitable for these.

Slow Series.

The great difference in density and character of negatives renders it impossible to make any definite statements with regard to exposure. The 'slow' plates exposed *in contact* with a certain clear and somewhat thin negative have been found to require for black tones an exposure of about thirty seconds at a distance of one foot from an ordinary fishtail gas-flame, or one inch of magnesium wire burnt at a distance of three feet. The exposures given under the heading of 'Warm Tones' also refer to the same negative. Denser negatives will, of course, require more.

DEVELOPMENT.

For BLACK TONES any of the following formulæ are suitable :—

Pyro Ammonia.

Solution No. 1.

Pyrogallic acid	1 ounce.
Sodium sulphite	1½ ,,
Citric acid	¼ ,,
Distilled water to	10 ounces.

Solution No. 2.

Liquor ammoniæ, ·880	1 ounce.
Ammonium bromide	1 ,,
Distilled water to	10 ounces.

For use, take 45 minims of each solution and make up with water to 2 ounces.

Ferrous Oxalate Developer.

Solution No. 1.

Neutral oxalate of potash	16 ounces.
Citric acid	60 grains.
Hot water	50 ounces.

Solution No. 2.

Proto-sulphate of iron	4 ounces.
Citric acid	15 grains.
Hot water	8 ounces.

Solution No. 3.

Bromide of potassium	¼ ounce.
Water	10 ounces.

For development, take 6 ounces of No. 1 and add 1 ounce of No. 2 and 24 drops of No. 3. Gives cold black tones.

Eikonogen Developer.

Solution No. 1.

Eikonogen	½ ounce.
Sodium sulphite	1½ ,,
Potassium bromide	8 grains.
Distilled water to	30 ounces.

Solution No. 2.

Potassium carbonate	1 ounce.
Distilled water to	10 ounces.

Take three parts of No. 1 to one part of No. 2 solution.

Rodinal Developer.

Rodinal concentrated solution	1 part.
Water	30 parts.

This is a very clean developer, and gives a rich black colour.

Hydroquinone.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ ,,
Potassium bromide	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	20 ,,

For use, take ½ ounce of each to 1 ounce of water.

WARM TONES.—DEVELOPER.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ ,,
Potassium bromide	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	20 ,,

Solution No. 3.

Bromide of ammonium	1 ounce.
Carbonate of ammonium	1 ,,
Water to	20 ounces.

Brown.

Exposure: 60 seconds 1 foot from gas-flame, or 2 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 100 minims; water to 2 ounces. Time required in development, about 5 minutes.

Purple-Brown.

Exposure: 90 seconds 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 200 minims; water to 2 ounces. Time required in development, about 10 minutes.

Purple.

Exposure: 3 minutes 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce: solution 3, 250 minims; water to 2 ounces. Time required in development, about 12 minutes.

Red.

Exposure: 5 minutes 1 foot from gas-flame, or 5 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 300 minims; water to 2 ounces. Time required in development, about 15 minutes.

FIXING BATH.

The simplest is the following:—

Hyposulphite of soda	6 ounces.
Water	20 ,,

After fixing, the transparency is well washed for one hour in several complete changes of water.

ROUCH'S FORMULÆ.

A.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water, to make	10 ,,

Dissolve the sulphite of soda in hot water, and, when cold, add the pyrogallic acid. Should any portion of the sulphite refuse to dissolve, the crystals may be allowed to remain in the bottle.

B.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
C.	Strongest liquor ammoniæ	3 ounces.
	Water, to make	10 ,,

In case sulphite of soda be not readily obtainable, the following may be substituted for solution A as above, and used in the same manner:—

Pyrogallic acid	1 ounce.
Citric acid	50 grains.
Water, to make	10 ounces.

Dissolve the citric acid first, and then add the pyro.

THOMAS'S FORMULÆ.

Pyrogallic Acid and Ammonia.

Stock Solutions.

No. 1.	Pyrogallic acid	1 ounce.
	Sodium sulphite	3 ounces.
	Potassium bromide	½ ounce.
	Citric acid	¼ ,,
	Distilled or boiled water to make	10 ounces.
No. 2.	Liq. ammonia ·880	1 ounce.
	Distilled or boiled water to make	10 ounces.

To make 1 ounce of developer, take 20 minims of No. 1 solution and 10 minims of No. 2 solution, and dilute with water to 1 ounce. When detail is out, add 10 minims more of No. 2 to increase density.

This formula represents 2 grains of pyro, 1 grain of potassium bromide, and 1 minim of liq. ammonia ·880 per ounce of developer. In case of under-exposure, these plates will bear the further addition of 1 minim of liq. ammonia ·880 (= 10 minims of No. 2 solution) without fogging.

Pyrogallic Acid and Soda.

Stock Solutions.

No. 1.	Pyrogallic acid	1 ounce.
	Sodium sulphite	4 ounces.
	Citric acid	¼ ounce.
	Potassium bromide	¼ ,,
	Distilled or boiled water to make	20 ounces.
No. 2.	Carbonate of soda (washing soda)	6 ounces.
	or boiled water to make	20 ,,

To make 1 ounce of developer, take 1 drachm of each solution and 6 drachms of water.

Over-exposure requires less of No. 2, and under-exposure more.

This formula represents 3 grains of pyro and 18 grains of carbonate of soda in each ounce of developer.

Metol Developer.

No. 1.	Metol	100 grains.
	Sodium sulphite	2 ounces.
	Distilled or boiled water to make	20 ,,
No 2.	Carbonate of potash	¾ ounce.
	Carbonate of soda, crystals (washing soda)	1 ,,
	Potassium bromide	40 grains.
	Distilled or boiled water to make	20 ounces.

For normal exposure take equal parts of each solution.
For over-exposure take less of No. 2.

Hydroquinone-Soda Developer.

No. 1.	Hydroquinone	160 grains.
	Sodium sulphite	2 ounces.
	Citric acid	60 grains.
	Potassium bromide	40 ,,
	Distilled or boiled water to make	20 ounces.
No. 2.	Sodium hydrate	160 grains.
	Distilled or boiled water to make	20 ounces.

Take equal quantities of each solution, mixed with the same quantity of water.

In hot weather 3 or 4 grains of potassium bromide may be added to each ounce of diluted developer.

An addition of 2 or 3 grains of potassium bromide to each ounce of developer will always give a clearer and more brilliant image.

Transparency Developers.

Hydroquinone.

No. 1.	Hydroquinone	160 grains.
	Sodium sulphite	2 ounces.
	Citric acid	60 grains.
	Potassium bromide	40 ,,
	Water to	20 ounces.
No. 2.	Sodium hydrate	160 grains.
	Water to	20 ounces.
No. 3.	Bromide ammonium	2 ounces.
	Water to	20 ,,
No. 4.	Carbonate ammonium	2 ounces.
	Water to	20 ,,

Pyrogallic Acid.

No. 1.	Pyrogallic acid	1 ounce.
	Sulphite soda	3 ounces.
	Citric acid	¼ ounce.
	Water to	10 ounces.
No. 2.	Liq. ammonia ·880	1 ounce.
	Water to	10 ounces.
No. 3.	Bromide ammonium	1 ounce.
	Water to	10 ounces.
No. 4.	Carbonate ammonia	1 ounce.
	Water to	10 ounces.

Exposures and development formulæ with approximate time required for development at temperature of 60 degrees.

Black Tone.

Hydroquinone.

Exposure, 1 in. Mg., Distance 3 feet.

Developer No. 1	½ ounce.
,, No. 2	½ ,,
Water to	2 ounces.

Time, about 2 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1	30 minims.
,, No. 2.	30 ,,
,, No. 3.	30 ,,
Water to	2 ounces.

Time, about 2 minutes.

Brown Tone.

Hydroquinone.

Exposure, 2 in. Mg., Distance 1 foot.

Developer No. 1.	½ ounce.
,, No. 2.	½ ,,
,, No. 3.	15 minims.
,, No. 4.	15 ,,
Water to	2 ounces.

Time, about 7 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1.	30 minims.
,, No. 2.	30 ,,
,, No. 3.	45 ,,
,, No. 4.	45 ,,
Water to	2 ounces.

Time, about 7 minutes.

Purple Tone.

Hydroquinone.

Exposure, 3 in. Mg., Distance 1 foot.

Developer No. 1.	½ ounce.
,, No. 2.	½ ,,
,, No. 3.	30 minims.
,, No. 4.	30 ,,
Water to	2 ounces.

Time, about 10 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1.	30 minims.
,, No. 2.	30 ,,
,, No. 3.	120 ,,
,, No. 4.	120 ,,
Water to	2 ounces.

Time, about 10 minutes.

Red Tone.

Hydroquinone.

Exposure, 6 in. Mg., Distance 1 foot.

Developer No. 1.	½ ounce.
,, No. 2.	½ ,,
,, No. 3.	90 minims.
,, No. 4.	90 ,,
Water to	2 ounces.

Time, about 15 minutes.

N.B.—For the warm tones, development must be carried much beyond what is apparently sufficient, so much is lost in fixing. A yellow light is recommended to be used, as it greatly facilitates judging of tone. It should also be mentioned that richness of tone is entirely dependent on depth to which development is carried.

Fixing Bath.

We recommend the following as giving great immunity from stain :—

Hypo	5 ounces.
Sulphite of soda	1 ounce.
Water	20 ounces
Dissolve and add sulphuric acid	1 drachm.

WRATTEN & WAINWRIGHT'S FORMULÆ

I.—Pyrogallic Acid.

Stock Solution A.

Liquor ammoniæ, s.g. ·880	1 ounce.
Potassium bromide	60 grains.
Water	2 ounces.

*Stock Solution B.**

Pyrogallic acid	1 ounce.
Citric acid or sulphurous acid	½ drachm.
Water	10 ounces.

* For the 'Ordinary' plates, B should contain only half the quantity of pyrogallic acid.

Stock Solution C.

Potassium bromide	20 grains.
Water	1 ounce.

Stock Solution D.

Liquor ammoniæ, s. g. ·880	1 drachm.
Water	1 ounce.

II.—For Drop Shutter Special Plates.

Stock Solution B.

Pyrogallic acid	1 ounce.
Citric acid or sulphurous acid	½ drachm.
Water	10 ounces.

Stock Solution A.

Liquor ammoniæ, ·880	1 ounce.
Bromide potassium	100 or 120 grains.
Water	2 ounces.

Soda Developer.

No. 1.	Sulphite of soda	6 ounces.
	Water	80 ,,
	Sulphuric acid (pure)	1 drachm.
	Pyro	1 ounce.
No. 2.	Carbonate of soda	6 ounces.
	Water	80 ,,

Mix in equal parts for correct exposures.

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See Page 24.

APPLICATIONS FOR PATENTS CONNECTED WITH THE PHOTOGRAPHIC ART.

(*Corrected up to date of going to Press.*)

No. 21,164.—"Improvements in Lantern-slide Binding Clamps.' J. F. H. EDWARDS.—*Dated November*, 1894.

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No. 10,712.—"Improvements in Oxyhydrogen Multiple Jet Apparatus." Complete specification. H. Brier and The Scotch and Irish Oxygen Company, Limited.—*Dated June*, 1895.

No. 10,725.—"A Method of Developing and Fixing Photographic Negatives or Prints by means of Rollers, Cylinders, or Pads. J. W. Collings.—*Dated June*, 1895.

No. 10,730.—"Improvements in Photometers." F. H. Nalder, C. W. S. Crawley, A. Soames, and A. P. Trotter.—*Dated June*, 1895.

No. 10,749.—"Improvements in and relating to Method of and Apparatus for the Production of Coloured Photographs." Communicated by M. Anderson. Complete specification. P. Jensen.—*Dated June*, 1895.

No. 10,784.—"Improved Photographic Dishes for Development of Films and Papers." R. J. Parker.—*Dated June*, 1895.

No. 11,084.—"Improvements in Apparatus for Holding and Displaying Photographs, Pictures, Advertisements, and the like." F. G. Pierpoint.—*Dated June*, 1895.

No. 11,092.—"A Machine or Apparatus for Mounting Photographs and the like." C. Hoddle.—*Dated June*, 1895.

No. 11,098.—"Improvement in Photographic Cameras." F. Ostermann. —*Dated June*, 1895.

No. 11,160.—"Improvements connected with Optical or Magic Lanterns." A. Wrench.—*Dated June*, 1895.

No. 11,194.—"Improvements in or connected with Photographic Apparatuses." Complete specification. G. Franke.—*Dated June*, 1895.

No. 11,197.—"Improvements in Photographic Shutters.' S. D. McKellen. —*Dated June*, 1895.

No. 11,302.—"Improvements in Photographic Cameras." J. Zion.—*Dated June*, 1895.

No. 11,445.—"Improvements in Hand or Magazine Cameras." F. W. Hudlass.—*Dated June*, 1895.

No. 11,608.—"Improvements in Changing Boxes for Photographic Cameras." W. Stanbury.—*Dated June*, 1895.

No. 11,632.—"Improvements in or connected with the Printing and Retouching of Photographic Negatives." C. W. R. Campbell and F. N. Albany. —*Dated June*, 1895.

No. 11,821.—"Improvements in Means for facilitating the Separation of Gelatine Coatings from Paper Supports in the Manufacture of Photographic Films." J. B. B. Wellington.—*Dated June*, 1895.

No. 11,937.—"Improvements in the Production of Photographic Enlargements." A. A. Barratt and A. J. E. Hill.—*Dated June*, 1895.

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See Page 26.

No. 11,953.—"Improvements in Photo-mechanical Printing." A. B. Chatwood.—*Dated June*, 1895.

No. 11,973.—"Improvements in Lights and Reflectors for Photography by Electric and other Lamps." C. B. Crawshaw and R. Kennedy.—*Dated June*, 1895.

No. 12,047.—"An Improved Method of Changing Photographic Plates or Films." A. Millar.—*Dated June*, 1895.

No. 12,375.—"Improvements in the Apparatus used for obtaining Photographs." C. H. Adkins.—*Dated July*, 1895.

No. 12,398.—"An Improved Process of Dyeing with Photographic Mordanting."—J. Helouis and C. de S. Père.—*Dated July*, 1895.

No. 12,426.—"The Water or Spirit or Liquid Magnifying Lens for Reading Glasses, Photographic Lenses, and other similar purposes for which a Magnifying Power is required." S. J. Small.—*Dated July*, 1895.

No. 12,458.—"Improvements in or relating to Photographic Cameras." The European Blair Camera Company, Limited, and T. H. Blair.—*Dated July*, 1895.

No. 12,488.—"Improvements in the Construction of Apparatus for Washing and Draining Photographic Prints and Plates." G. F. Wynne.—*Dated July*, 1895.

No. 12,515.—"Improvements in Photographic Printing Frames." E. Mosely.—*Dated July*, 1895.

No. 12,526.—"Improvements in Photographic Apparatus for Changing Sensitive Surfaces arranged as a Pack." J. D. Lysaght.—*Dated July*, 1895.

No. 12,567.—"An Improved Method of Obtaining Stereoscopic Photographic Pictures." J. B. King and F. R. Pool.—*Dated July*, 1895.

No. 12,672.—"An Improved Method of Photo-etching." F. W. J. Henning.—*Dated July*, 1895.

No. 12,859.—"An Improved Photographic Shutter and Method of Operating the same." C. D. Durnford.—*Dated July*, 1895.

No. 12,949.—"Improvements in Lenses for Photographic Purposes." R. Steinheil.—*Dated July*, 1895.

No. 13,040.—"Improvements in or relating to the Ornamentation of Picture Frames, Photograph Screens, and similar articles." F. Wich.—*Dated July*, 1895.

No. 13,042.—"Improvements in or relating to Photographic Shutters." R. Schultze.—*Dated July*, 1895.

No. 13,079.—"Improvements in or relating to Photographic Cameras and Shutters." J. B. Irving.—*Dated July*, 1895.

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No. 13,162.—"Improvements in Objectives for photographic purposes." Complete Specification. C. P. GOERZ and E. VON HÖEGH.—*Dated July*, 1895.

No. 13,203.—"Improvements in and relating to the production of Photographs of Animals." W. I. CHADWICK.—*Dated July*, 1895.

No. 13,377.—"Improvements in the production of Prints by Photography, and in Apparatus for the purpose." W. F. GREENE.—*Dated July*, 1895.

No. 13,400.—"Improvements in Photographic Apparatus." W. E. HICKLING.—*Dated July*, 1895.

No. 13,428.—"A Process and Apparatus for Flattening Mounted Photographs." E. RENARD.—*Dated July*, 1895.

No. 13,697.—"A New or Improved Camera for Photographic Purposes." C. OLIVER.—*Dated July*, 1895.

No. 13,948.—"An Improvement in Portable Photographic Cameras." Communicated by T. Finch. W. HARDING.—*Dated July*, 1895.

No. 13,959.—"Improvements in and connected with the Manufacture of Oxygen." Complete specification. H. L. A. LAPOINTE.—*Dated July* 1895.

No. 14,058.—"Improvements in Photographic Apparatus." M. HIRSCHENSOHN.—*Dated July*, 1895.

No. 14,104.—"Improvements in Papers for Photographic Purposes. Complete specification. H. WANDROWSKY.—*Dated July*, 1895.

No. 14,202.—"Improvements in Cameras and in Fittings for the same.' A. E. SALT.—*Dated July*, 1895.

No. 14,208.—"Improvements in Producing Inexplosive Acetylene Gas." C. E. BICHEL and E. SCHULTE.—*Dated July*, 1895.

No. 14,387.—"Improvements in Lenses." Communicated by A. Quentin. A. J. BOULT.—*Dated August*, 1895.

No. 14,663.—"Improvements in Stands for supporting Cameras, Theodolities, Levels, Magic Lanterns, and other Analogous Purposes in Frames for Screens, for use with Magic Lanterns and other Analogous Frames, in Easels and in Frameworks for Tents and other Analogous Frameworks." W. BROUGHTON.—*Dated August*, 1895.

No. 14,862.—"Improvements in Camera Slides or Holders for Cut Films.' C. P. MACCARTHY.—*Dated August*, 1895.

No. 14,943.—"Short's Photographic Changing Box for Plates." M. SHORT. —*Dated August*, 1895.

No. 15,013.—"An Improvement in the Turntables of Photographic Cameras." E. GILYARD and H. COUSEN.—*Dated August*, 1895.

No. 15,093.—"Improved Intensifier, Reducer, and Toner, for Photographi Purposes." A. HILL.—*Dated August*, 1895.

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No. 15,220.—"Improvements in Photographic Magazine Cameras." J. N. WIGLE.—*Dated August*, 1895.

No. 15,631.—"A Photographic Mount for Memorial, Wedding, or other Greeting Cards." J. W. BARRS.—*Dated August*, 1895.

No. 15,706.—"Improvements in and connected with Photographic and Lantern Portable Tripod Stands." Messrs. W. BUTCHER & SON (W. BUTCHER and W. F. BUTCHER).—*Dated August*, 1895.

No. 15,714.—"Improvements in or relating to the Production of Photographic Transparencies or Positive Pictures." F. STERNBERG.—*Dated August*, 1895.

No. 15,846.—"Improvements in Joints for Fishing-rods, Easels, Camera Stands, and other Purposes." J. PUMPHREY.—*Dated August*, 1895.

No. 15,882.—"Improvements in or connected with Photographic Shutters." Complete specification. F. A. BROWNELL.—*Dated August*, 1895.

No. 15,934.—"Self-stripping, Print-out Gelatine Dry Plates." A. HILL.—*Dated August*, 1895.

No. 15,935.—"Improved Means of obtaining Photographs in true Relief in Gold, Silver, and other Metals." A. HILL and A. A. BARRATT.—*Dated August*, 1895.

No. 16,045.—"Improvements in and connected with Photographic Dry (or Wet) Plates and Films." J. W. COLLINGS.—*Dated August*, 1895.

No. 16,070.—"Improved Stereopticon Panorama Apparatus." Complete specification. C. A. CHASE.—*Dated August*, 1895.

No. 16,117.—"An Improved Finder for Photographic Purposes." A. HEYWOOD.—*Dated August*, 1895.

No. 16,315. "Improvements in and relating to Photographic Change-boxes."—W. W. BEASLEY. *Dated August*, 1895.

No. 16,467.—"Adjustable Tripod Head for Photographic Cameras." J. LAWTON.—*Dated September*, 1895.

No. 16,516.—"Improvements in the Production of Coloured Photographs." H. S. FEARON.—*Dated September*, 1895.

No. 16,517.—"An Improved Optical Apparatus to Facilitate the Drawing and Colouring of Landscape and other Pictures." H. S. FEARON.—*Dated September*, 1895.

No. 16,548.—"Photography in Colours." F. W. LANCHESTER. *Dated September*, 1895.

No. 16,603.—"Improvements in Dark-room Lamps used in the Manipulation of Photographic Sensitive Surfaces and Substances." J. W. HUNTER.—*Dated September*, 1895.

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No. 16,628.—"Improvements in Spools or Reels for the Winding of Flexible Photographic Film." G. Dickman.—*Dated September*, 1895.

No. 16,640.—"Improvements in Photographic Lenses." H. L. Aldis.—*Dated September*, 1895.

No. 16,810.—"Photographic Enamel." C. P. Douglas.—*Dated September*, 1895.

No. 16,876.—"An Improved Adjustable Support for Photographic Cameras, Surveying and other Instruments and Articles requiring adjustment." F. G. Lynde.—*Dated September*, 1895.

No. 16,901.—"An Improved Limelight Lantern for Illuminating Purposes," &c. W. Butcher & Son (W. Butcher and W. F. Butcher).—*Dated September*, 1895.

No. 16,902.—"Improvements relating to Stands for Cameras and other Scientific Instruments." W. Butcher & Son (W. Butcher and W. F. Butcher).—*Dated September*, 1895.

No. 17,448.—"Improvements in Photographic Change-boxes and the like. W. R. Baker.—*Dated September*, 1895.

No. 17,892.—"Perfect Photographic Developing Dishes." F. Melton.—*Dated September*, 1895.

No. 17,893.—"Improvements in Photographic Printing Frames." L. Dawkins.—*Dated September*, 1895.

No. 17,930.—"Improvements in Photographic Cameras and Magic Lanterns." W. Friese-Greene.—*Dated September*, 1895.

No. 17,984.—"Improvements in View-finders for Photographic Cameras." W. Broughton.—*Dated September*, 1895.

No. 18,044.—"An Improved Process for Enamelling Photographic Proofs. E. Chesnay.—*Dated September*, 1895.

No. 18,214.—"Stereoscopic Attachment to Single-lens Cameras." S. G. Brown.—*Dated October*, 1895.

No. 18,279.—"Improvement in Appliances for Holding Cards, Photographs, and the like in their Position for Sale." G. W. Hughes.—*Dated October*, 1895.

No. 18,611.—"Improvements in Frames for Holding Photos and suchlike." M. Henderson.—*Dated October*, 1895.

No. 18,695.—"An Improved Photographic Camera." H. Joly.—*Dated October* 1895.

No. 18,424.—"Improvements in and Apparatus for producing a Flashlight applicable for Photographic and other purposes." Communicated by E. Hackh. T. Langgaard.—*Dated October*, 1895.

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No. 18,753.—"Improvements in Photographic Enlarging Apparatus." Communicated by L. Gaumont. C. D. ABEL.—*Dated October*, 1895.

No. 18,974.—"An Adjustment for the Lenses of Stereoscopes." SIR D. ALOMONS, Bart.—*Dated October*, 1895.

No. 19,014.—"The 'Beat-all' Improved Photographic Print Washer."—. R. BOAG and H. ANTON.—*Dated October*, 1895.

No. 19,133.—"Improved Washing Tank applicable for Photographic Purposes." Complete Specification. D. ALLAN.—*Dated October*, 1895.

No. 19,278.—"A Device for use in Mounting Photographs and the like.' R. J. KERR.—*Dated October*, 1895.

No. 19,541.—"Improvements in Photographic Cameras." L. J. R. HOLST.—*Dated October*, 1895.

No. 19,606.—"A New or Improved Plummet or Level, particularly applicable for use upon Photographic Cameras." F. P. NEWLEY.—*Dated October*, 1895.

No. 19,616.—"Improvements in Dishes for Photographic Purposes." E. L. C. LAMBERT.—*Dated October*, 1895.

No. 19,711.—"Method of obtaining a Colour-sensitive Film or Plate." J. JOLY.—*Dated October*, 1895.

No. 19,948.—"Improvements in Incandescent Gas Apparatus for Photographic purposes." F. S. THORN and C. HODDLE.—*Dated October*, 1895.

No. 20,167.—"Improvements in the Production of Photographic Portraits. Communicated by F. Davey. W. DAVEY.—*Dated October*, 1895.

No. 20,539.—"Improvements in Apparatus for Use in Binding Lantern and like Slides." R. SMITH.—*Dated November*, 1895.

No. 20,604.—"A New or Improved Photographic Dark Slide Spring Catch and Exposure Recorder for Cameras." F. P. NEWLEY.—*Dated November*, 1895.

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See Page 27.

EQUIVALENCE OF THE ALKALIES.

Mr. W. B. Bolton's Table.

Caustic Soda.	Caustic Potash.	Ammonia.	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
1	1·400	0·425	2·650	7·150	3·450	4·350	2·115
0·714	1·	0·304	1·893	5·170	2·464	3·107	1·510
2·353	3·294	1·	6·235	16·823	8·117	10·235	4·976
0·377	0·528	0·160	1·	2·698	1·301	1·641	0·798
0·140	0·196	0·059	0·370	1·	0·482	0·608	0·295
0·290	0·405	0·123	0·768	2·072	1·	1·261	0·613
0·230	0·322	0·098	0·609	1·644	0·793	1·	0·486
0·473	0·662	0·201	1·253	3·380	1·631	2·057	1·

Mr. G. E. Brown's Table.

Caustic Soda.	Caustic Potash.	Ammonia (·880 solution).	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammo
80	112	97·14	106	286	138	174	12
1	1·400	·867	1·325	3·575	1·725	2·174	1·587
·714	*1*	1·211	·946	2·553	1·232	1·554	1·134
·834	1·153	*1*	1·091	2·944	1·421	1·791	1·307
·755	1·033	·916	*1*	2·698	1·302	1·641	1·198
·280	·392	·340	·371	*1*	·483	·608	·444
·580	·812	·704	·768	2·072	*1*	1·260	·920
·460	·644	·558	·609	1·644	·793	*1*	·730
·630	·882	·765	·835	2·252	1·087	1·370	*1*

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See Page 24.

TABLE SHOWING THE HOURLY VARIATION IN THE SUN'S POSITIO

CALCULATED

		A.M.						
Mean Time		5	6	7	8	9	10	11
Jan. 1						41° E.	29° E.	16° E
Feb. 1					59° E.	47	35	19
,, 20					63	50	36	20
Mar. 8				77° E.	65	52	37	21
,, 21				80	67	53	38	22
April 2			94° E.	82	69	55	40	21
,, 19		108° E.	97	85	72	58	41	21
May 8	4 A.M.	111	100	89	76	61	44	22
,, 27	125° E.	114	103	91	79	65	47	26
June 22	127° E.	116	106	95	82	68	51	28
July 18		115	104	93	81	67	51	29
Aug. 5		114	101	91	78	62	47	27
,, 25			97	85	73	59	43	23
Sept. 10			92	80	67	54	38	19
,, 23			88	77	64	50	35	17
Oct. 6				73	60	46	31	15
,, 22				69	57	44	29	12
Nov. 9					53	40	27	11
,, 22					52	39	25	11
Dec. 22						40	27	15

Calculated for latitude 52°

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IN DEGREES FROM THE SOUTH, AT DIFFERENT SEASONS OF THE YEAR.

J. A. C. Branfill.

	P.M.							
Noon	1	2	3	4	5	6	7	8
1° E.	13° W.	27° W.	40° W.					
4	12	27	40	53° W.				
4	13	29	44	57				
4	15	31	46	61	73° W.			
3	17	34	49	64	77	89° W.		
1	20	39	54	69	81	92		
1° W.	22	42	58	73	85	97	108° W.	
2	26	46	63	77	90	102	113	
1° W.	27	49	67	80	93	104	114	126° W.*
1° E.	27	49	67	81	94	105	115	127° W
2	23	46	64	79	91	102	113	125
2	22	44	61	75	88	100	111	
1	21	41	58	72	85	97	108*	
1° W.	21	39	55	69	82	94		
3	21	38	53	67	79			
4	21	37	52	65	77			
5	20	36	50	63				
5	19	34	47	59				
4	19	33	45					
1° W.	15	28	41					

N.B.—Bearings marked * are taken when the sun is below the horizon.

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See Page 26.

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.

(LUNGE AND WIERNIK.

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH g.	Correction of Sp. Gr for ± 1
1·000	0·00	0·1	0·00018
0·898	0·45	4·5	0·00018
0·996	0·91	9·1	0·00019
0·994	1·37	13·6	0·00019
0·992	1·84	18·2	0·00020
0 990	2·31	22·9	0·00020
0·988	2·80	27·7	0·00021
0·986	3·30	32·5	0·00021
0·984	3·80	37·4	0·00022
0·982	4·30	42·2	0·00022
0·980	4·80	47·0	0·00023
0·978	5·30	51·8	0·00023
0·976	5·80	56·6	0·00024
0·974	6·30	61·4	0·00024
0·972	6·80	66·1	0·00025
0·970	7·31	70·9	0·00025
0·968	7·82	75·7	0·00026
0·966	8·33	80·5	0·00026
0·964	8·84	85·2	0·00027
0·962	9·35	89·9	0·00028
0·960	9·91	95·1	0·00029
0·958	10·47	100·3	0·00030
0·956	11·03	105·4	0·00031
0·954	11·60	110·7	0·00032
0·952	12·17	115·9	0·00033
0·950	12·74	121·0	0·00034
0·948	13·31	126·2	0·00035
0·946	13·18	131·3	0·00036
0·944	14·46	136·5	0·00037
0·942	15·04	141·7	0·00038

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See Page 27.

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.—*Continued.*

(LUNGE AND WIERNIK.)

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH_3 g.	Correction of Sp. Gr for ± 1°.
0·940	15·63	146·9	0·00039
0·938	16·22	152·1	0·00040
0·936	16·82	157·4	0·00041
0·934	17·42	162·7	0·00041
0 932	18·03	168·1	0·00042
0·930	18·64	173·4	0·00042
0·928	19·25	178·6	0·00043
0·926	19·87	184·2	0·00044
0·924	20·49	189·3	0·00045
0·922	21·12	194·7	0·00046
0·920	21·75	200·1	0·00047
0·918	22·39	205·6	0·00048
0·916	22·03	210·9	0·00049
0·914	23·68	216·3	0·00050
0·912	24·33	221·9	0·00051
0·910	24·99	227·4	0·00052
0·908	25·65	232·9	0·00053
0 906	26·31	238·3	0·00054
0 904	26·98	243·9	0·00055
0·902	27·65	249·4	0·00056
0·900	28·33	255·0	0·00057
0·898	29·01	260·5	0·00058
0·896	29·69	266·0	0 00059
0·894	30·37	271·5	0·00060
0·892	31·05	277·0	0·00060
0·890	31·75	282·6	0·00061
0·888	32·50	288·6	0·00062
0·886	33·25	294·6	0·00063
0·884	34·10	301·4	0·00064
0·882	34·95	308·3	0·00065

FOCUSSING WITH PINHOLE APERTURES.

Mr. K. Isawa, in the course of a paper on *Pinhole Photography*, gives the following table :—

Herewith is a table for correcting focussing. The plates are moved nearer the objective as per the indication. Measures in millimetres.

	For Infinity.	For Sizes of Image.									
		1/10	2/10	3 10	4/10	5/10	6/10	7/10	8/10	9/10	10/10
Focal length...	200	220	240	260	280	300	320	340	360	380	400
Correction...	4	5	6	7	8	9	10	11·5	13	14·5	16
Focal length...	250	275	300	325	350	375	400	425	450	475	500
Correction...	5	6	7	8·5	10	11	13	14·5	16	18	20
Focal length...	300	330	360	390	420	450	480	510	540	570	600
Correction...	6	7	8·5	10	11·5	13·5	15·5	17	19·5	21·5	24
Focal length...	400	440	480	520	560	600	640	680	720	760	800
Correction...	7	10	11·5	13·5	15·5	18	20·5	23	26	29	32
Focal length...	850	495	540	585	630	675	720	765	810	855	900
Correction...	9	11	18	15	17·5	20	23	26	29	33	36
Focal length...	500	550	600	650	700	750	800	850	900	950	1000
Correction...	10	12	14·5	17	20	22·5	25·5	29	32·5	36	40
Focal length...	550	605	660	715	770	825	880	935	990	1045	100
Correction...	11	13·5	16	18·5	21·5	25	28	32	36	40	44
Focal length...	600	660	710	780	840	900	960	1020	1080	1140	1200
Correction...	12	14·5	17	20	23 5	27	31	34·50	39	43·5	48

RELATIVE EXPOSURES FOR VARYING PROPORTIONS OF IMAGE TO THE ORIGINAL.

[The following paper was read before the Photographic Society of Great Britain by Mr. W. E. Debenham. Its usefulness would be diminished by abbreviation, hence we reproduce it in full.—Ed.]

When an enlarged photograph has to be made, either from a negative or print, it is commonly understood that the greater the degree of enlargement the longer will be the exposure required, but I have generally found only the vaguest ideas to exist as to the amount by which such exposure has to be prolonged. Sometimes, indeed, it is assumed that the exposure will be in direct inverse proportion to the area covered, so that a copy of twice the linear dimensions of the original—covering, as it does, the area of four times the size—would require an exposure of four times that sufficing for a copy of the same size. This calculation, however, omits to recognise an important factor, and leads to serious error; the actual exposure required in the case mentioned (assuming the same lens and stop to be used) being not four times, but two and a quarter times, that of a copy of same size; whilst, when we come to high degrees of enlargement, the error would amount to an indication of nearly four times the exposure actually required.

To find the relative exposure, add one to the number of times that the length of the original is contained in the length of the image, and square the sum. This will give the figure found in the third column of the annexed table.

Proportion of image to original (linear).	Distance of image from lens * in terms of principal focus.	Proportionate exposures.	Exposures proportioned to that required for copying same size.
$\frac{1}{30}$	$1\frac{1}{30}$	1·07	·27
$\frac{1}{20}$	$1\frac{1}{20}$	1·10	·28
$\frac{1}{10}$	$1\frac{1}{10}$	1·21	·3
$\frac{1}{8}$	$1\frac{1}{8}$	1·27	·31
$\frac{1}{6}$	$1\frac{1}{6}$	1 36	·34
$\frac{1}{4}$	$1\frac{1}{4}$	1·56	·39
$\frac{1}{2}$	$1\frac{1}{2}$	2·25	·56
$\frac{3}{4}$	$1\frac{3}{4}$	3·06	·76
Same 1	2	4	1
size) 2	3	9	2·25
3	4	16	4
4	5	25	6·25
5	6	36	9
6	7	49	12·25
7	8	64	16
8	9	81	20·25
9	10	100	25
10	11	121	30·25
11	12	144	36
12	13	169	42·25
13	14	196	49
14	15	225	56 25
15	16	256	64
16	17	289	72·25
17	18	324	81
18	19	361	90·25
19	20	400	100
20	21	441	110·25
21	22	484	121
22	23	529	132·25
23	24	576	144
24	25	625	156·25
25	26	676	169
26	27	729	182·25
27	28	784	196
28	29	841	210·25
29	30	900	225
30	31	961	240·25

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* With a double lens it is usually sufficient to measure from the position of the diaphragm plate.

As examples: suppose a copy is wanted having twice the linear dimensions of the original. Take the number 2, add 1 to it, and square the sum, $3^2=9$. Again, if a copy is to be of eight times the linear dimensions of the original, take the number 8, add 1, and square the sum, $9^2=81$. Copies respectively twice and eight times the size (linear) of the original will thus require relative exposures of 9 and 81—*i.e.*, the latter will require nine times the exposure of the former.

It is convenient to have a practical standard for unity. An image of the same size as the original is a familiar case, and serves as such standard. By dividing the figures in the third column by four, we get at the figures in the last column, which represent the exposure required for varying degrees of enlargement or reduction, compared with the exposure for a copy of the same size.

The table is carried up to enlargements of thirty diameters; that is about the amount required for enlarging a small *carte-de-visite* to life size.

The exposures required in reductions do not vary at all to the same extent that they do in enlargements. It has, therefore, not been thought necessary to fill in the steps between images of $\frac{1}{10}$ and $\frac{1}{20}$, and between $\frac{1}{20}$ and $\frac{1}{30}$ of the size of the original. Beyond $\frac{1}{30}$ there is scarcely any perceptible difference in the exposure until disturbance comes in from another cause, a considerable distance of illuminated atmosphere (haze or fog) intervening.

The figures in the second column will also serve as a table for distances from the lens to the plate and to the original, all that is necessary being to multiply by the principal focus of the lens in use. In the case of enlargements the figures less than 2 must be multiplied to get the distance from the original to the lens, and the figures greater than 2 for the distance from lens to image. For reductions, the figures less than 2, multiplied by the principal focus of the lens, yield the distance from lens to plate; and the figures higher than 2, similarly multiplied, give the distance of original from lens.

SOLUBILITY OF THE SILVER HALOIDS.

By E. Valenta.

In the *Royal Photographic Society's Journal* the following table, the result of a series of experiments, is given.

Solvent.	Concentration.	100 g. of solution can dissolve in grammes.			Remarks.
		Ag Cl.	Ag Br.	Ag I.	
Sodium hyposulphite	1 : 100	0·40	0·35	0·03	The estimations were made at 20° C.
,,	5 : 100	2·00	1·90	0·15	
,,	10 : 100	4·10	3·50	0·30	
,,	15 : 100	5·50	4·20	0·40	
,,	20 : 100	6·10	5·80	0·60	
Ammonium hyposulphite	1 : 100	0·57	—	—	For bromide and iodide of silver similar results were obtained as with sodium hyposulphite.
,,	5 : 100	1·32	—	—	
,,	10 : 100	3·92	—	—	
Sodium sulphite	10 : 100	0·44	0·04	0·01	
,,	20 : 100	0·95	0·08	0·02	
Ammonium sulphite	10 : 100		traces		
Ammonium carbonate	10 : 100	0·05	—	—	
Ammonia	3 %	1·40	—	—	
,,	15 %	7·58	—	—	
Magnesium chloride	50 : 100	0·50	—	—	
Potassium cyanide	5 : 100	2·75	6·55	8·23	25° C.
Ammonium sulphocyanide	5 : 100	0·08	0·21	0·02	23° C.
,,	10 : 100	0·54	2·04	0·08	
,,	15 : 100	2·88	5·30	0·13	
Potassium sulphocyanide	10 : 100	0·11	0·73	—	25° C.
Calcium sulphocyanide	10 : 100	0·15	0·53	0·03	
Barium sulphocyanide	10 : 100	0·20	0·35	0·02	
Aluminium sulphocyanide	10 : 100	2·02	4·50	0·02	
Thiocarbamide	10 : 100	0·83	1·87	0·79	25° C.
Thiosinamin	1 : 100	0·40	0·08	0·008	
,,	5 : 100	1·90	0·35	0·05	
,,	10 : 100	3·90	0·72	0·09	

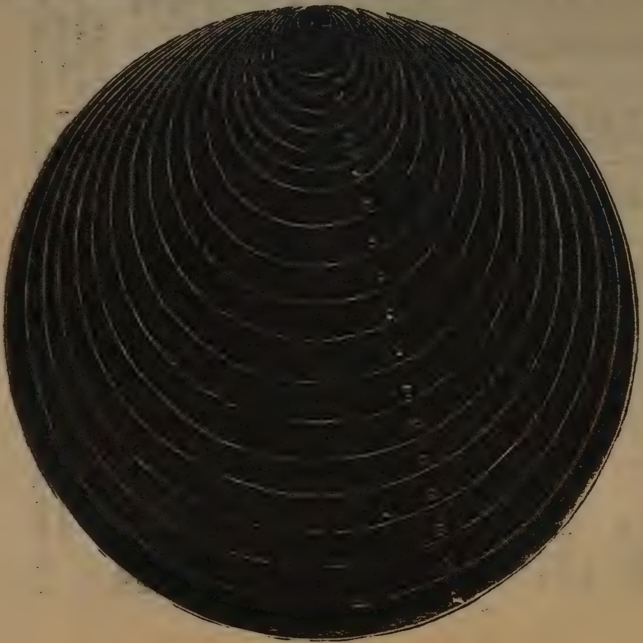
'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Royal Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14·06	58	210·25
1¼	·097	16	16	59	217·56
1·414	⅛	17	18·06	60	225·00
1½	·140	18	20·25	61	232·56
1¾	·191	19	22·56		240 25
2	¼	20	25·00	63	248·06
2¼	·316	21	27·56	64	256
2½	·390	22	30·25	65	264·06
2·828	½	22·62	32	66	272·25
2¾	·472	23	33·06	67	280·56
3	·562	24	36·00	68	289·00
3¼	·660	25	39·06	69	297·56
3½	·765	26	42·25	70	306·25
3¾	·878	27	45·56	71	315·06
4	1·00	28	49·00	72	324·00
4¼	1·12	29	52·56	73	333·06
4½	1·26	30	56·25	74	342·25
4¾	1·41	31	60·06	75	351·56
5	1 56	32	64	76	361·00
5¼	1·72	33	68·06	77	370·56
5½	1·89	34	72·25	78	380·25
5·656	2	35	76·56	79	390·06
5¾	2·06	36	81·00	80	400·00
6	2·25	37	85·56	81	410·06
6¼	2·44	38	90·25	82	420·25
6½	2·64	39	95·06	83	430·56
6¾	2 84	40	100·00	84	440·00
7	3·06	41	105·06	85	451·56
7¼	3·28	42	110·25	86	462·25
7½	3·51	43	115·56	87	473·06
7¾	3·75	44	121·00	88	484·00
8	4	45	126·56	89	495·06
8¼	4·25	45·25	128	90	506·25
8½	4·51	46	132·25	90· 50	512
8¾	4·78	47	138·06	91	517·56
9	5·06	48	144·00	92	529·00
9¼	5·34	49	150·06	93	540·56
9½	5·64	50	156·25	94	552·25
9¾	5·94	51	162·56	95	564·06
10	6·25	52	169·00	96	576 00
11	7·56	53	175·56	97	588·06
11·31	8	54	182·25	98	600·25
12	9·00	55	189·06	99	612·56
13	10·56	56	196 00	100	625·00
14	12 25	57	203·06		

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Royal Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number is called the 'U. S.' (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: a lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5, we find in the column under—'focus eight inches' the number 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	6¼	10	14	19	25	31	40	56	
4	4	6¼	9	12	16	20	25	36	48
5	2¾	4¼	6¼	8½	11	14	17	25	34
6	2	3⅕	4½	6¼	8	10	13	18	25
7	1½	2½	3½	4¾	6	8	10	14	19
8	1¼	2	2¾	3¾	5	6¼	8	11	15
9	1	1½	2¼	3	4	5	6¼	9	12¼
10		1	1½	2⅛	2¾	3½	4⅓	6	8½
11			1¼	1½	2	2½	3⅕	5	6
12			⅞	1⅕	1½	2	2½	3½	4¾
13				1	1¼	1⅚	1⅔	2¾	4
14					1	1¼	1½	2¼	3
15						1	1⅓	1⅞	2½
16							1	1½	2
17								1⅓	7⅔
18								1⅙	1½
19								1	1⅓
20									1⅙
21									1

TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

WITH a view of simplifying the calculations involved in emulsion-making, the late Mr. William Ackland a few years ago worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognised style will find their labours materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98	1·734	·576	1·918	·521	1·106
Potassium ,, ...	119·1	1·427	·700	1·578	·633	
Sodium ,, ...	103	1·650	·606	1·825	·548	
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh.	136	1·25	·800	1·382	·723	
Zinc ,, ...	112·1	1·509	·663	1·670	·600	
Ammonium chloride	53·5	3·177	·315	2·682	·373	·844
Sodium ,, ...	58·5	2·906	·344	2·453	·408	
Ammonium iodide	145	1·172	·853	1·620	·617	1·382
Potassium ,, ...	166·1	1·023	·977	1·415	·707	
Sodium ,, ...	150	1·133	·882	1·566	·638	
Cadmium ,, ...	183	·929	1·076	1·284	·778	

The principal bromides, chlorides, and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. I. presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:—

Bromide of potassium	150 grains.
Iodide of potassium	10 ,,
Chloride of ammonium	10 ,,
Gelatine	200 ,,

Now we want to know how much silver nitrate should be employed in sensitising this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:—

Potassium bromide .... 150 × 1·427 = 214
,, iodide .... 10 × 1·023 = 10·23
Chloride of ammonium ... 10 × 3·177 = 31·77
} Weight silver nitrate required,

or the total quantity of silver nitrate required for full conversion, 256·00 grains.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide. (Coml.)	Cadmium Bromide. (Anhyd.)	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide............	**1**	·823	·951	·57	·72	·87	1·832	1·675	·676	·59	·653	·535
Potassium ,, ...	1·215	**1**	1·156	·692	·876	1·058	2·226	2·036	·821	·717	·794	·651
Sodium ,, ...	1·051	·865	**1**	·599	·757	·915	1.925	1·761	·71	·62	·686	·563
Cadmium ,, com.	1·755	1·444	1·67	**1**	1·265	1·527	3·215	2·94	1·186	1·035	1·146	·94
,, ,, anh.	1·387	1·141	1·32	·79	**1**	1·207	2·542	2·324	·938	·819	·906	·743
Zinc ,, ...	1·149	·945	1·093	·655	·828	**1**	2·104	1·925	·776	·678	·75	·615
Ammonium chloride........ ...	·546	·449	·519	·311	·393	·475	**1**	·914	·369	·322	·356	·292
Sodium ,, ...	·597	·491	·568	·34	·43	·519	1·093	**1**	·403	·352	·39	·319
Ammonium iodide..............	1·479	1·217	1·408	·843	1·066	1·287	2·712	2·478	**1**	·873	·966	·792
Potassium ,, ...	1·695	1·394	1·612	·965	1·221	1·475	3·104	2·839	1·145	**1**	1·107	·907
Sodium ,, ...	1·53	1·259	1·456	·872	1·103	1·332	2·803	2·564	1·034	·903	**1**	·819
Cadmium ,, ...	1·867	1·536	1·776	1·064	1·345	1·625	3·42	3·128	1·262	1·102	1·22	**1**

TABLE No. II. gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed 'Ammonium Bromide,' we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1·215; that is to say, 1·215 grain of potassium bromide will be required to do the same work as one of NH_4Br.

UNIVERSAL EXPOSURE TABLE.

By F. B. Taylor.

Exposure = A × B × C × D × E seconds.
Intermediate factors 3/8, 3/4, 3/2, 3, 6 for **f/10, f/14, f/20,** &c.

Factor.	A. Subject and Distance to Shadows.	B. Stop.	C. Light.	D. Altitude of Sun.	E. Plate.
1/16	Clouds or distant mountains. **over ½ mile.**	f/4	Expose for the shadows. *Less* exposure is required at high elevations, *e.g.* 5000 feet above sea level; and variations may be indicated by the colour of buildings or foliage, or lighting of interiors.		
1/8	Sea coast with sky or ships. **¼ mile.**	f/5·6			
1/4	Open landscape, or distant view. No near foreground. **100 yards.**	f/8	Angle of view when p/f = ·5, 1, 1·5, 2. is 28°, 53°, 74°, 90°. Diff. for ·1, 6°, 5°, 4°, 3°.		**25 War.** Extra rapid. Drop shutter.
1/2	Landscape with trees. **100 feet.**	f/11	Full sun light.	90° to 80°	**22 23 W.** Rapid: 60 times.
1	View with near buildings or trees. **40 feet.**	f/16	Bright diffused light.	70° to 54°	**20 W.** Instantaneous 30 times.
2	Dark foliage in close foreground: Buildings in shade. **20 feet.**	f/22	Dull light.	36° to 27°	**17-18 W.** Ordinary: 15 times.
4	Portrait out of doors: Copying same size. **10 feet.**	f/32	Very gloomy.	18° to 14°	**15 W.** Slow. 10 times. wet.
8	Under trees. Indoor portrait near large window.	f/45	Slight fog.	9° to 7°	F. B. T. June, 1895.

For **portraits** in ordinary rooms × by **16**: For **interiors** read **B × C × D × E** in **minutes**; reduce if well lighted or extensive.
For **enlargements or reductions n** times × by **(n + 1)²**. Distance of lens from plate = (n + 1) **f** = **n** times distance of lens from original.

Index of definition **ad = 3f²**, which is constant for each lens; stop **f/a.**
Focus on object at **d** yards, all beyond **d/2** yards is in focus.
Focus on distant object, all beyond **d** yards is in focus.

FORM OF NOTE-BOOK

No.	Lens.	A. Subject. ¶ A, 40 ft. B, f/16. C, Bright, diffused. ‖ D, Sun 70°—54°. E, 20 W or 30 times. **Exposure 1 × 1 × 1 × 1 × 1 = 1 Sec.**	B. Stop.	C. Light.
	in.		f/	
	in.		f/	

TABLE OF SUN'S ALTITUDE FOR LATITUDES.

North 53 40 0 23	June 21.	May 22. July 22.	Apr. 21. Aug. 21	Mar. 22. Sept. 21.	Feb. 20. Oct. 21.	Jan. 20. Nov. 21.	Dec. 21.	North 53 40 0 23
12 Noon	60 73 67 90	57 70 70 87	49 62 78 79	37 50 90 67	25 38 78 55	17 30 70 47	14 27 67 44	12 Noon.
11 A. M. 1 P. M.	58 69 62 76	54 65 65 75	46 58 70 71	35 47 75 62	23 35 70 52	15 27 65 43	13 24 62 41	11 A. M. 1 P. M.
10 A. M. 2 P. M.	52 60 52 63	49 57 54 62	41 50 57 59	31 41 60 52	20 30 57 44	12 23 54 37	9 20 52 31	10 A. M. 2 P. M.
9 A. M. 3 P. M.	45 49 40 49	41 46 41 48	35 41 43 45	24 32 45 40	14 23 43 33	7 16 41 28	4 14 40 25	9 A. M. 3 P. M.
8 A. M. 4 P. M.	37 38 27 36	33 35 27 31	27 30 28 31	17 22 30 27	7 13 28 21	0 8 27 17	. 5 27 15	8 A. M. 4 P. M.
7 A. M. 5 P. M.	27 26 14 22	24 24 14 21	18 19 14 17	9 11 15 13	. 3 14 7	. . 14 4	. . 14 3	7 A. M. 5 P. M.
6 A. M. 6 P. M.	18 15 0 7	15 12 0 6	8 7 0 3	0 0 0 0	. . 0 .	. . 0 .	. . 0 .	6 A. M. 6 P. M.
5 A. M. 7 P. M.	10 4 . .	7 2 . .	Speed of plates.					
4 A. M. 8 P. M.	2 . . .							
South 53 40 0 23	Dec. 21.	Nov. 21. Jan. 20	Oct. 21. Feb. 20	Sept. 21 Mar. 22.	Aug. 21. Apr. 21.	July 22. May 22.	June 21.	South 53 40 0 23

FOR USE WITH ABOVE.

D. Date, Hour, Sun's Alt.	E. Plate.	Factors.					Exposure.		Remarks.
		A.	B.	C.	D.	E.	Due.	True.	
: : ; m.	W.								Developer.
: : ; m.	W.								Developer.
: :									Developer.

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARDS.

[The following is reprinted from the Society's *Journal.*]

The Standards adopted by the Society in 1881 have been carefully reconsidered to see what additions or modifications were desirable.

The following statement is complete so far as the subjects it deals with are concerned:—

Lens Diaphragms.

It is recommended:—

1st. That the aperture of the standard-unit diaphragm have a diameter equal to one-fourth the equivalent focal length of the lens.

2nd. That diaphragms with smaller openings have apertures diminishing in area to the extent of one-half from the unit standard downwards.

3rd. That every diaphragm be marked with its intensity ratio, and also with the relation that the diameter of its aperture bears to the equivalent focal length of the lens, thus:—

$$\frac{f}{4};\ 2\,\frac{f}{5{\cdot}6};\ 4\,\frac{f}{8};\ 8\,\frac{f}{11{\cdot}3};\ 16\,\frac{f}{16};\ 32\,\frac{f}{22{\cdot}6};\ 64\,\frac{f}{32};\ 128\,\frac{f}{45{\cdot}2};\ 256\,\frac{f}{64};\ \&c.$$

Should a lens not admit of a diaphragm with an aperture as large in diameter as one-fourth its focal length, nor exactly any one of the above-mentioned sizes, it is still recommended that all the apertures be made in uniformity with the above scale, with the exception of the largest, which should be marked with the number its area requires in relation to the unit diaphragm. In the case of a lens having a working aperture exceeding in diameter one-fourth its focal length, the diaphragms should be marked according to the sizes of their relative apertures: for example:—

$$0{\cdot}5\,\frac{f}{2{\cdot}8};\ 0{\cdot}25\,\frac{f}{2},\ \&c.$$

And diaphragms which require to be made with apertures intermediate to the standard sizes should be marked in a corresponding manner.

Lens Mounts and Fittings.

It is recommended:—

1st. That the equivalent focal length of each lens be engraved upon ts mount.

2nd. That the following series of screws for photographic lens flange fittings be adopted:—

Diameter in Inches.	No. of Threads per Inch.	Core Diameter in Inches.
1	24	·9466
1·25	24	1·1966
1·5	24	1·4466
1·75	24	1·6966
2	24	1·9466
2·25	24	2·1966
2·5	24	2·4466
3	24	2·9466
3·5	12	3·3933
4	12	3·8933
5	12	4·8933
And upwards, advancing by inches.	12	

The form of thread is that known as Whitworth's Angular Thread, and is designed as follows:—Two parallel lines, at a distance apart equal to 0·96 of the screw pitch, are intersected by lines inclined to each other at 55°. One-sixth of the vertical height of the triangular spaces so obtained is rounded off both at the top and bottom. The depth of this thread is 0·64 of the screw pitch.

3rd. That every flange and adapter have a mark upon its front to indicate the position of the diaphragm slot or index of any lens when screwed home. The mark on any adapter should coincide with the mark upon any flange into which it is screwed. This mark should be placed at the point at which the thread becomes complete at the shoulder of the flange or adapter.

CAMERA SCREWS.

It is recommended:—

That all screws fitted to cameras, either for attachment to the stand, for fixing rising fronts, or for other movable parts, be either $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, or $\frac{3}{8}$ of an inch in external diameter, and in pitch of thread and other details in accordance with the generally recognised Whitworth standards for these sizes.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC, AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

NAME.		Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminium		Al^{iii}	27·4	9·13
Antimony (Stibium)		Sb^{iii}	122·0	40·66
Arsenic		As^{iii}	75·0	25·0
Barium		Ba^{ii}	137·0	68·5
Bismuth		Bi^{iii}	208·0	69·33
Boron		B^{iii}	11·0	3·66
Bromine		Br^{i}	80·0	80·0
Cadmium		Cd^{ii}	112·0	56·0
Cæsium		Cs^{i}	133·0	133·0
Calcium		Ca^{ii}	40·0	20·0
Carbon		C^{iv}	12·0	3·0
Cerium		Ce^{ii}	92·0	46·0
Chlorine		Cl^{i}	35·5	35·5
Chromium		Cr^{ii}	52·2	26·1
Cobalt		Co^{ii}	58·8	29·4
Columbium (or Niobium)		Cb^{v}	94·0	18·8
Copper (Cuprum)	Cuprosum	Cu^{i}	63·4	63·4
	Cupricum	Cu^{ii}	63·4	31·7
Davyum		Da	...	...
Didymium		Di^{ii}	95·0	47·5
Erbium		E^{ii}	112·6	56·3
Fluorine		Fl^{i}	19·0	19·0
Gallium		Ga	68·0	...
Glucinum		Gl^{ii}	9·4	4·7
Gold (Aurum)		Au^{iii}	196·0	65·33
Hydrogen		H^{i}	1·0	1·0
Indium		In^{iii}	113·4	37·8
Iodine		I^{i}	127·0	127·0
Iridium		Ir^{iv}	198·0	49·5
Iron (Ferrum)	Ferrosum	Fe^{ii}	56·0	28·0
	Ferricum	Fe^{iii}	56·0	18·66
Lanthanum		La^{ii}	92·8	46·4
Lead (Plumbum)		Pb^{ii}	207·0	103·5
Lithium		Li^{i}	7·0	7·0
Magnesium		Mg^{ii}	24·0	12·0
Manganese		Mn^{ii}	55·0	27·5
Mercury (Hydrargyrum)	Mercurosum	Hg	200·0	200·0
	Mercuricum	Hg^{ii}	200·0	100·0
Molybdenum		Mo^{ii}	92·0	46·0
Nickel		Ni^{ii}	58·8	29·4
Nitrogen		N^{iii}	14·0	4·66
Osmium		Os^{iv}	199·0	49·75
Oxygen		O^{ii}	16·0	8·0
Palladium		Pd^{ii}	106·5	53·25

TABLE OF SYMBOLS, &c.—CONTINUED.

NAME.		Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Phosphorus		$\mathrm{P^{iii}}$	31·0	10·33
Platinum	Platinosum	$\mathrm{Pt^{ii}}$	197·4	98·7
	Platinicum	$\mathrm{Pt^{iv}}$	197·4	49·35
Potassium (Kalium)		K	39·1	39·1
Rhodium		$\mathrm{Rh^{ii}}$	104·4	52·2
Rubidium		$\mathrm{Rb^{i}}$	85·4	85·4
Ruthenium		$\mathrm{Ru^{iv}}$	104·0	26·0
Selenium		$\mathrm{Se^{ii}}$	79·4	39·7
Silicium (or Silicon)		$\mathrm{Si^{iv}}$	28·0	7·0
Silver (Argentum)		$\mathrm{Ag^{i}}$	108·0	108·0
Sodium (Natrium)		$\mathrm{Na^{i}}$	23·0	23·0
Strontium		$\mathrm{Sr^{ii}}$	87·5	43·75
Sulphur		$\mathrm{S^{ii}}$	32·0	16·0
Tantalum		$\mathrm{Ta^{v}}$	182·0	36·4
Tellurium		$\mathrm{Te^{ii}}$	128·0	64·0
Thallium		$\mathrm{Te^{i}}$	204·0	204·0
Thorium (or Thorinum)		$\mathrm{Th^{iv}}$	231·5	57·87
Tin (Stannum)	Stannosum	$\mathrm{Sn^{ii}}$	118·0	59·0
	Stannicum	$\mathrm{Sn^{iv}}$	118·0	29·5
Titanium		$\mathrm{Ti^{iv}}$	50·0	12·5
Tungsten (Wolfram)		$\mathrm{W^{iv}}$	184·0	46·0
Uranium		$\mathrm{Ur^{ii}}$	120·0	60·0
Vanadium		$\mathrm{V^{iii}}$	51·3	17·1
Yttrium		$\mathrm{Y^{ii}}$	61·7	30·85
Zinc		$\mathrm{Zn^{ii}}$	65·2	32·6
Zirconium		$\mathrm{Zr^{iv}}$	89·6	22·4

FREEZING MIXTURES.

THE following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	The Temperature at starting being 50° Fahr. the thermometer sinks.	Diminution of Temperature.
1	Water	1	From + 50° to + 4°	46° Fahr.
	Nitrate of ammonia	1		
2	Water	16	„ + 50° „ + 10°	40° „
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	„ + 50° „ + 7°	43° „
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	2	„ 32° „ – 5	37° „
	Chloride of sodium	1		
5	Snow	2	„ + 32° „ – 50°	82° „
	Crystallised chloride of calcium	3		
	Crystallised sulphate of soda	8	„ + 50° „ 0°	50° „
	Hydrochloric acid	5		

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

NAME.	SYMBOL.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
,, Hydrochloric	$H Cl$	36·5
,, Hydrocyanic	$H CN$	27
,, Hydrosulphuric	$H_2 S$	34
,, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
,, Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alum, Chrome	$Cr K (SO_4)_2 12 H_2 O$	499·3
,, (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Ammonium, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Sulphydrate of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 2 H_2 O$	170·4
,, Sulphate ,,	$Cu SO_4 5 H_2 O$	249·4
Gold, Terchloride	$Au Cl_3$	302·5
Iron, Chloride (ferrous)	$Fe Cl_2$	127
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Iodide	$Fe I_2$	310
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 H_2 O$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4, (NH_4)_2 SO_4 + 6 H_2 O$...	392
Lead, Acetate (Cryst.)	$Pb, (C_2 H_3 O_2)_2 + H_2 O$	343

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Lead, Nitrate	$Pb, (NO_3)_2$	331
Lithium, Bromide	$Li\ Br$	87
,, Chloride	$Li\ Cl$	42·5
,, Iodide	$Li\ I$	134
Magnesium, Bromide	$Mg\ Br_2$	184
,, Chloride	$Mg\ Cl_2$	95
,, Iodide	$Mg\ I_2$	278
Mercury, Chloride (Mercuric)	$Hg\ Cl_2$	271
Platinum, Chloride	$Pt\ Cl_4$	339·4
Potassium, Bichromate	$K_2\ Cr_2\ O_7$	294·6
,, Acetate	$K\ C_2\ H_3\ O_2$	98·1
,, Bromide	$K\ Br$	119·1
,, Carbonate	$K_2\ CO_3$	138·2
,, Chloride	$K\ Cl$	74·6
,, Citrate	$K_3\ C_6\ H_5\ O_7 + H_2\ O$	324·3
,, Cyanide	$K\ C\ N$	65·1
,, Ferridcyanide	$K_6\ Fe_2\ Cy_{12}$	658·6
,, Ferrocyanide	$K_4\ Fe\ Cy_6$	368·4
,, Hydrate	$K\ OH$	56·1
,, Iodide	$K\ I$	166·1
,, Nitrate	$K\ NO_3$	101·1
,, Permanganate	$K_2\ Mn_2\ O_8$	316·2
Silver, Acetate	$Ag\ C_2\ H_3\ O_2$	167
,, Bromide	$Ag\ Br$	188
,, Carbonate	$Ag_2\ CO_3$	276
,, Chloride	$Ag\ Cl$	143·5
,, Citrate	$Ag_3\ C_6H_5O_7$	513
,, Fluoride	$Ag\ Fl$	127
,, Iodide	$Ag\ I$	235
,, Nitrate	$Ag\ NO_3$	170
,, Oxalate	$Ag_2\ C_2\ O_4$	304
,, Oxide	$Ag_2\ O$	232
,, Sulphide	$Ag_2\ S$	248
Sodium, Acetate (Cryst.)	$Na\ C_2\ H_3\ O_2\ 3\ H_2\ O$	136
,, Biborate (Borax)	$Na_2\ B_4\ O_7 + 10\ H_2\ O$	382
,, Bromide	$Na\ Br$	103
,, Carbonate (Cryst.)	$Na_2\ CO_3 + 10\ H_2\ O$	286
,, Chloride	$Na\ Cl$	58·5
,, Citrate	$2\ (Na_3\ C_6\ H_5\ O_7)\ 11\ H_2\ O$	714
,, Hyposulphite (Cryst.)	$Na_2\ S_2\ O_3 + 5\ H_2\ O$	248
,, Iodide	$Na\ I$	150
,, Sulphite	$Na_2\ SO_3\ 7\ H_2\ O$	252
Strontium, Bromide	$Sr\ Br_2$	247·5
,, Chloride	$Sr\ Cl_2$	158·5
,, Iodide	$Sr\ I_2$	341·5
Uranium, Bromide	$U\ Br_2\ 4\ H_2\ O$	352
,, Nitrate	$U_2\ O_2\ (NO_3)_2\ 6\ H_2\ O$	504
Zinc, Bromide	$Zn\ Br_2$	225·2
,, Chloride	$Zn\ Cl_2$	136·2
,, Iodide	$Zn\ I_2$	319·2

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Acid, Boracic (Anhydrous)	47·01	...	2·13	soluble
,, ,, (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
Gallic	100·0	3·0	1·0	soluble in 4 parts
,, Oxalic	15·5	1·0	6·47	insoluble
,, Pyrogallic	2·25	...	...	sol. in alc. and ether
,, Salicylic	87·2	vry sol	0·35	easily soluble
,, Succinic	5·0	2·2	20·0	soluble in 3 parts
,, Tannic	very	solubl	e	sol. in alc. and ether
,, Tartaric	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
,, (Ammonia)	7·32	,,	13·66	,,
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
,, Carbonate	3·3	·833	33·0	insoluble
,, Chloride	2·7	1·00	37·02	sparingly soluble
,, Citrate	deliqu	escent	vy. sol.	less sol. in alcohol
,, Iodide	very	solubl	e	soluble
,, Nitrate	2·0	1·0	50·0	freely soluble
,, Salicylate	very	solubl	e	
,, Succinate	,,	,,		
,, Sulphocyanide	deliqu	escent	easily	sol. in water and alc.
arium, Bromide	·96	...	104·2	easily soluble
,, Chloride { Crystallised	2·18	...	46·0	very slightly soluble
Anhydrous.	2·862	...	34·1	
,, Iodide	0·48	0·35	208·3	easily soluble
,, Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	solubl	e	easily soluble
,, Chloride	0·71	0·67	...	,,
,, Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.)	0·97	...	102·56	easily soluble
,, Chloride	0·25	any qy	400·0	
,, Iodide	deliqu	escent		
Cobalt, Chloride	very	solubl	e	sol. in alc. and ether
Copper, Bromide (Cupric)	deliqu	escent	vy. sol.	,, ,,
,, Chloride ,,	,,	,,	,,	,, ,,
,, Nitrate	solubl	e	...	very soluble
,, Sulphate	2·5	...	40·0	insoluble
Gold, Perchloride	deliqu	escent	vy. sol.	soluble in ether
Iron, Chloride { Anhyd.	2·0	...	50·0	sol. in 1 part alcohol
(Ferrous) { Hydrated	0·68	...	147·0	easily soluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Iron, Chloride (Ferric)	very	del. &	sol.	very soluble
,, Oxalate ,,	insolu	ble, ex	cept in	excess of oxalic acid
,, Sulphate ,,	solubl	e	...	soluble
,, ,, (Ferrous)	1·3	·30	77·0	insoluble
Lead, Acetate	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate	7·7	...	13·0	
Lithium, Bromide	0·66	...	149·8	soluble
,, Chloride	1·315	...	76·0	
,, Iodide	0·61	...	164·0	
Magnesium, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	1·857	...	53·8	
,, Iodide	deliqu	escent	vy. sol.	soluble
,, Sulphate	1·47	0·66	68·04	slightly soluble
Mercury, Chloride (Mercuric)	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride	solubl	e	...	easily sol. in alc. & ether
Potassium, Bichromate	10·0	...	10·0	
,, Bromide	1·55	...	64·5	
,, Carbonate	0·9	...	111·0	
,, Chloride	3·03	2·0	33·0	slightly soluble
,, Citrate	very	solubl	e	
,, Cyanide	deliqu	escent	vy. sol.	insol. in pure alcohol
,, Ferrocyanide	3·0	1·0	33·3	insoluble
,, Ferridcyanide	2·54	1·22	39·37	very sparingly soluble
,, Hydrate	0·5	...	200·0	very soluble
,, Iodide	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate	3·5	0·4	28·57	insoluble
,, Nitrite	deliqu	& solu	ble	
,, Oxalate(neutral)	3·0	...	33·3	slightly soluble
,, ,, (bin.)	40·0	...	2·5	insoluble
,, ,, (quad.)	20·17	...	4·95	insoluble
,, Permanganate	16·0	...	6·25	insoluble
,, Sulphocyanide				
Silver, Acetate	very	slightl	y sol.	
,, Citrate	solubl	e in wa	rm wate	r
,, Fluoride	deliqu	escent		
,, Nitrate	1·0	0·5	100·0	sol. in 4 pts. boiling alc.
,, Nitrite	300·0	dissol. easily	0·33	insoluble
,, Oxalate	spar'ly sol.	solubl	e	insoluble

TABLE OF THE SOLUBILITIES, &c.—Continued.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Silver, Sulphate	200·0	88·0	0·5	insoluble
Sodium, Acetate (Cryst.)	2·86	·66	35·0	
,, Biborate (Borax)	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite (Thiosulphate)	deliquescent		vy. sol.	insoluble
,, Iodide	0·55	0·3	180·0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliquescent		vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very soluble			
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very soluble		...	insoluble
,, Sulphocyanide				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25 0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide (Hydrated)	deliqu & soluble			soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliquescent		vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. deliques. & sol.			very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—Carius.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0·9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22 0	0·9484	13·0	0·9831	4·0
0 8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0·9026	28·0	0·9283	19·0	0·9593	10·0	0·9959	1·0

THERMOMETRIC TABLES,

SHOWING THE ASSIMILATION OF THE THERMOMETERS IN USE THROUGHOUT THE WORLD.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176·0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·3
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

CONVERSION OF GRAINS AND OUNCES INTO GRAMMES.

	Grains to Grammes.	Ounces to Grammes.	Grains to the Ounce=Grammes to 100 c.c.
1	0·06479	28·3495	0·22817
2	0·12958	56·9660	0·45635
3	0·19437	85·0485	0·68452
4	0·25916	113·3980	0·91269
5	0·32395	141·7475	1·14086
6	0·38874	170·0970	1·36904
7	0·45353	198·4465	1·59721
8	0·51832	226·7960	1·82538
9	0·58311	255·1455	2·05356

CONVERSION OF MINIMS, DRACHMS, OUNCES, AND PINTS TO CUBIC CENTIMETRES AND LITRES.

	Minims to c.c.	Drachms to c.c.	Ounces to c.c.	Pints to Litres.
1	0·05916	3·5495	28·396	0·56792
	0·11832	7·0990	56·792	1·13584
3	0·17748	10·6485	85·188	1·70376
	0·23664	14·1980	113·584	2·27168
5	0·29580	17·7475	141·980	2·83960
6	0·35496	21·2970	170·376	3·40752
7	0·41412	24·8465	198·772	3·97544
8	0·47328	28·3960	227·168	4·54336
9	0·53244	31·9455	255·564	5·11128

FRENCH FLUID MEASURES.

THE cubic centimètre, usually represented by 'c. c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1	cubic centimètre	=	17	minims (as near as possible).							
2	cubic centimètres	=	34	,,							
3	,,	=	51	,,							
4	,,	=	68	,,	or	1	drachm	8	minims.		
5	,,	=	85	,,	,,	1	,,	25	,,		
6	,,	=	102	,,	,,	1	,,	42	,,		
7	,,	=	119	,,	,,	1	,,	59	,,		
8	,,	=	136	,,	,,	2	drachms	16	,,		
9	,,	=	153	,,	,,	2	,,	33	,,		
10	,,	=	170	,,	,,	2	,,	50	,,		
20	,,	=	340	,,	,,	5	,,	40	,,		
30	,,	=	510	,,	,,	1	ounce	0	drachm	30	minims.
40	,,	=	680	,,	,,	1	,,	3	drachms	20	,,
50	,,	=	850	,,	,,	1	,,	6	,,	10	,,
60	,,	=	1020	,,	,,	2	ounces	1	,,	0	,,
70	,,	=	1190	,,	,,	2	,,	3	,,	50	,,
80	,,	=	1360	,,	,,	2	,,	6	,,	40	,,
90	,,	=	1530	,,	,,	3	,,	1	,,	30	,,
100	,,	=	1700	,,	,,	3	,,	4	,,	20	,,

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHTS.

ALTHOUGH a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be 15$\frac{2}{5}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1	gramme	=	15$\frac{2}{5}$	grains.						
2	grammes	=	30$\frac{4}{5}$	,,						
3	,,	=	46$\frac{1}{5}$	,,						
4	,,	=	61$\frac{3}{5}$	,,	....	or	1	drachm	1$\frac{3}{5}$	grain.
5	,,	=	77	,,	....	,,	1	,,	17	grains.
6	,,	=	92$\frac{2}{5}$	,,	....	,,	1	,,	32$\frac{2}{5}$	,,
7	,,	=	107$\frac{4}{5}$	,,	....	,,	1	,,	47$\frac{4}{5}$	,,
8	,,	=	123$\frac{1}{5}$	,,	....	,,	2	drachms	3$\frac{1}{5}$	,,
9	,,	=	138$\frac{3}{5}$	,,	....	,,	2	,,	18$\frac{3}{5}$	,,
10	,,	=	154	,,	....	,,	2	,,	34	,,
11	,,	=	169$\frac{2}{5}$	,,	....	,,	2	,,	49$\frac{2}{5}$	,,
12	,,	=	184$\frac{4}{5}$	,,	....	,,	3	,,	4$\frac{4}{5}$	,,
13	,,	=	200$\frac{1}{5}$	,,	....	,,	3	,,	20$\frac{1}{5}$	,,
14	,,	=	215$\frac{3}{5}$	,,	....	,,	3	,,	35$\frac{3}{5}$	,,
15	,,	=	231	,,	....	,,	3	,,	51	,,
16	,,	=	246$\frac{2}{5}$	,,	....	,,	4	,,	6$\frac{2}{5}$	,,
17	,,	=	261$\frac{4}{5}$	,,	....	,,	4	,,	21$\frac{4}{5}$	,,
18	,,	=	277$\frac{1}{5}$	,,	....	,,	4	,,	37$\frac{1}{5}$	,
19	,,	=	292$\frac{3}{5}$	,,	....	,,	4	,,	52$\frac{3}{5}$	,,
20	,,	=	308	,,	....	,,	5	,,	8	,,
30	,,	=	462	,,	....	,,	7	,,	42	,,
40	,,	=	616	,,	....	,,	10	,,	16	,,
50	,,	=	770	,,	....	,,	12	,,	50	,,
60	,,	=	924	,,	....	,,	15	,,	24	,,
70	,,	=	1078	,,	....	,,	17	,,	58	,,
80	,,	=	1232	,,	....	,,	20	,,	32	,,
90	,,	=	1386	,,	....	,,	23	,,	6	,,
100	,,	=	1540	,,	....	,,	25	,,	40	,,

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	2 inches.	3 inches.	4 inches.	5 inches.	6 inches.	7 inches.	8 inches.
2	4 4	6 3	8 2⅔	10 2½	12 2⅖	14 2⅓	16 2 2/7	18 2¼
2½	5 5	7½ 3¾	10 3⅓	12½ 3⅛	15 3	17½ 2 11/12	20 2 6/7	22½ 2 13/16
3	6 6	9 4½	12 4	15 3¾	18 3⅗	21 3½	24 3 3/7	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4⅜	21 4⅕	24½ 4 1/12	28 4	31½ 3 15/16
4	8 8	12 6	16 5⅓	20 5	24 4⅘	28 4⅔	32 4 4/7	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅝	27 5⅖	31½ 5¼	36 5⅐	40½ 5 1/16
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5 5/7	45 5⅝
5½	11 11	16½ 8¼	22 7⅓	27½ 6⅞	33 6⅗	38½ 6 5/12	44 6 2/7	49½ 6 3/16
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6 6/7	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅙	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9⅐	72 9
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10 2/7	81 10⅛

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—7½. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2, and so on with any other numbers.

TABLE OF VIEW-ANGLES.

By Clarence E. Woodman, Ph.D.

(*Photographic Times.*)

Divide the Base of the Plate by the Equivalent Focus of the Lens;

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
·282	16	·748	41	1·3	66
·3	17	·768	42	1·32	67
·317	18	·788	43	1·36	68
·335	19	·808	44	1·375	69
·353	20	·828	45	1·4	70
·37	21	·849	46	1·427	71
·389	22	·87	47	1·45	72
·407	23	·89	48	1·48	73
·425	24	·911	49	1·5	74
·443	25	·933	50	1·53	75
·462	26	·954	51	1·56	76
·48	27	·975	52	1·59	77
·5	28	1·	53	1·62	78
·517	29	1·02	54	1·649	79
·536	30	1·041	55	1·678	80
·555	31	1·063	56	1·7	81
·573	32	1·086	57	1·739	82
·592	33	1·108	58	1·769	83
·611	34	1·132	59	1·8	84
·631	35	1·155	60	1·833	85
·65	36	1·178	61	1·865	86
·67	37	1·2	62	1·898	87
·689	38	1·225	63	1·931	88
·708	39	1·25	64	1·965	89
·728	40	1·274	65	2·	90

Example.—Given a lens of 13 inches equivalent focus; required the angle included by it on plates respectively 3¼ × 4¼, 4¼ × 6½, 6½ × 8½, 8 × 10, 10 × 12, and 11 × 14.

1. Dividing 4·25 by 13, we have as quotient ·327—midway between the decimals ·317 and ·335 of our table; therefore the required angle is 18° 30′. Similarly—

Degrees.
2. 6·5 ÷ 13 = ·5; corresponding to 28.
3. 8·5 ÷ 13 = ·654; „ „ 36.
4. 10 ÷ 13 = ·77; „ „ 42½.
5. 12 ÷ 13 = ·923 „ „ 49½.
6. 14 ÷ 13 = 1·08 „ „ 57.

EQUATIONS RELATING TO FOCI, &c.

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes :—

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versâ* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = 'Uniform System' No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p\,(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f\,(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N.B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

Note.—In case the above may not be clear to some photographers, the following rules may be better understood :—

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D) ; next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r, or $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r + 1$ and divide the product by r. Or divide D by $r + 1$.

To find the greater conjugate focus (F) multiply p by $r \pm 1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example : focus an object which is five inches high, so that it is one inch high on the ground glass ; thus we know that $r = 5$. Next measure the distance between the object and the ground glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$,

MR. E. M. NELSON'S TABLE OF DISTANCES FOR LANTERN PROJECTION.

DISTANCE OF PROJECTION LENS FROM SCREEN, MASK BEING THREE INCHES.

Foci	4½		5		5½		6		7		8		9		10		11		12	14		15		16		18	
Disc.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
5	7	10½	8	9	9	7½	10	6	12	3	14	0	15	9	17	6	19	3	21	24	6	26	3	28	0	31	6
6	9	4½	10	5	11	5½	12	6	14	7	16	8	18	9	20	10	22	11	25	29	2	31	3	33	4	37	6
7	10	10½	12	1	13	3½	14	6	16	11	19	4	21	9	24	2	26	7	29	33	10	36	3	38	8	43	6
8	12	4½	13	9	15	1½	16	6	19	3	22	0	24	9	27	6	30	3	33	38	6	41	3	44	0	49	6
9	13	10½	15	5	16	11½	18	6	21	7	24	8	27	9	30	10	33	11	37	43	2	46	3	49	4	55	6
10	15	4½	17	1	18	9½	20	6	23	11	27	4	30	9	34	2	37	7	41	47	10	51	3	54	8	61	6
11	16	10½	18	9	20	7½	22	6	26	3	30	0	33	9	37	6	41	3	45	52	6	56	3	60	0	67	6
12	18	4½	20	5	22	5½	24	6	28	7	32	8	36	9	40	10	44	11	49	57	2	61	3	65	4	73	6
13	19	10½	22	1	24	3½	26	6	30	11	35	4	39	9	44	2	48	7	53	61	10	66	3	70	8	79	6
14	21	4½	23	9	26	1½	28	6	33	3	38	0	42	9	47	6	52	3	57	66	6	71	3	76	0	85	6
15	22	10½	25	5	27	11½	30	6	35	7	40	8	45	9	50	10	55	11	61	71	2	76	3	81	4	91	6
16	24	4½	27	1	29	9½	32	6	37	11	43	4	48	9	54	2	59	7	65	75	10	81	3	86	8	97	6
18	27	4½	30	5	33	5½	36	6	42	7	48	8	54	9	60	10	66	11	73	85	2	91	3	97	4	109	6
20	30	4½	33	9	37	1½	40	6	47	3	54	0	60	9	67	6	74	3	81	94	6	101	3	108	0	121	6
25	37	10½	42	1	46	3½	50	6	58	11	67	4	75	9	84	2	92	7	101	117	10	126	3	134	8	151	6
30	45	4½	50	5	55	5½	60	6	70	7	80	8	90	9	100	10	110	11	121	141	2	151	3	161	4	181	6
35	52	10½	58	9	64	7½	70	6	82	3	94	0	105	0	117	6	129	3	141	164	6	176	3	188	0	211	6
40	60	4½	67	1	73	9½	80	6	93	11	107	4	120	9	134	2	147	7	161	187	10	201	3	214	8	241	6
45	67	10½	75	5	82	11½	90	6	105	7	120	8	135	9	150	10	165	11	181	211	2	226	3	241	4	271	6
50	75	4½	83	9	92	1½	100	6	117	3	134	0	150	9	167	6	184	3	201	234	6	251	3	268	0	301	6

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS.

SIR D. SALOMONS' TABLE.

Focus of Lens in inches.	Ratios marked on Stops.													
	f/7	*f*/8		*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15	*f*/16	*f*/17	*f*/18	*f*/19	*f*/20
	Number of feet after which all is in focus.													
4	19	17	15	14	13	12	11	10	9	9	8	8	7	7
4¼	21	19	17	15	14	12	11	11	10	10	9	9	8	7
4½	25	22	19	17	16	15	13	13	12	11	10	10	9	9
4¾	27	23	21	19	18	16	15	14	13	12	12	11	10	10
5	30	27	24	21	19	18	17	15	14	14	13	12	11	10
5¼	33	29	25	23	21	20	18	17	16	15	14	13	13	12
5½	37	31	29	26	23	22	20	19	17	16	15	15	14	13
5¾	39	34	31	28	26	24	22	20	18	18	17	16	15	14
6	43	38	33	31	28	26	24	22	21	20	18	17	16	15
6¼	47	41	37	33	30	23	26	24	22	20	20	19	18	17
6½	50	45	40	36	33	29	28	26	24	23	21	20	19	18
6¾	55	48	43	39	36	32	30	28	25	24	22	22	21	20
7	58	52	45	42	38	35	31	30	28	26	25	23	22	21

DR. J. J. HIGGINS'S TABLE.

Equivalent Focus.	*f*/5	*f*/6	*f*/7	*f*/8	*f*/9	*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15
5 inches	42	35	30	26	23	21	19	17½	16	15	14
5½ ,,	50½	42	36	32	28	25	23	21	19	18	17
6 ,,	60	50	43	38	34	30	27	25	23	21	20
6½ ,,	70½	59	50	44	39	35	32	29½	27	25	23½
7 ,,	82	68	59	51	45	41	39	34	31	29½	27

Calculated for a Confusion Disc of less than $\frac{1}{100}$ of an inch.

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